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Skeptical Inquirer

THE MAGAZINE FOR SCIENCE AND REASON

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AIDS Denialism

Psychology of the 'Unexplained'

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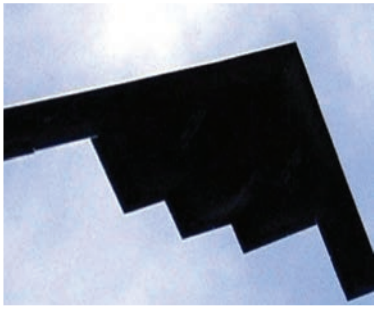

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[FROM THE EDITOR

Dr. Phil Gives Psychics a Pass

We know cable television has gone bonkers with paranormal programming. But if you think that network television, more than half a century old, has matured on that topic, think again. I just watched a new episode of the popular afternoon show *Dr. Phil* (May 25 on my local CBS affiliate) that professed to put psychics to the test. The good news is that they included one of our colleagues, Jim Underdown, as their skeptic to examine psychics' techniques. Jim is executive director of our Center for Inquiry–Los Angeles and head of the Independent Investigations Group. He is quite knowledgeable. But—surprise, surprise!—it turned out that he was up against not one, not two, but five self-proclaimed psychics. And while the psychics were given the status of sitting on the stage with host Dr. Phil (clinical psychologist Phil McGraw), Jim was relegated to the audience. This is what TV producers regard as balance.

The show got off to a reasonable start with Jim describing cold reading and then doing a reading of a group of selected people. He impressed three of them with his apparent personal knowledge of their problems. Then one of the psychics was shown making five or six straight misses as she attempted to cold read the same group. But those misses were quickly forgotten, and from there the show, from any rational viewpoint, plunged rapidly downward. That first psychic recovered and managed to get several in the group highly emotional about her apparent knowledge of their personal issues. Jim's protests that they had told the psychic the very information that they thought was being revealed were to no avail.

One by the one, the numerologist, the color reader (yes!), the intuitive, and the others were given free rein. Jim had little further opportunity to point out what they were up to and none to test any of them. And once he was revealed as a skeptic, the "psychics" repeatedly disparaged him. Finally "a scientist" was proudly brought in. I expected some scientific viewpoint to be expressed. But their scientist was in fact an ardent believer in psychic powers! How many respected psychologists—who tend to be overwhelmingly skeptical about psychic powers—the producers had to pass over to find one that actively advocates psychic powers we'll never know. As for Dr. Phil, he professed some mild skepticism but demonstrated none. Only Jim exhibited any critical thinking. An audience survey at the show's start indicated 78 percent believed in psychic powers; another at the end showed belief had risen to 84 percent. Given the show's totally biased set up, it's surprising it wasn't 100 percent. The producers should be ashamed.

* * * *

This issue is packed with solid articles. We begin with three independent examinations of the much-publicized case of collective conversion disorder, or mass psychogenic illness, in Le Roy, New York. Robert Bartholomew, Joe Nickell, and Steven Novella (in his "The Science of Medicine" column) provide complementary perspectives to understand such events. Nicoli Nattrass of the AIDS and Society Research Unit at the University of Cape Town contributes her second SI article on AIDS denialism, this one explaining why it is so resilient. And in this election season sociologist Jeffrey S. Victor steps back to look at some longstanding and powerful political myths that still influence voters. And that's just a start. Happy reading.

—Kendrick Frazier

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New Info Challenges 9/11 Thermite Claims

Dave Thomas

9/11 Truthers say that three World Trade Center (WTC) towers were taken down by controlled demolitions (CDs) and that airplanes and/or fires alone could not have toppled the buildings. However, CDs almost always require the use of high explosives, which produce a series of insanely loud bangs that can be heard for miles. Since the "boom boom boom" of explosives was totally absent in Manhattan on 9/11, Truthers needed to hypothesize a quiet method of doing CDs. That's when thermite, a mixture of aluminum and iron oxide powders, became a basic part of 9/11 Truther mythology. Thermite is quite stable at room temperature, but once ignited it burns brightly and slowly until the chemical chain reaction runs its course, getting hot enough to melt iron and steel in the process.

Thermite became the CD option the 9/11 Truthers wanted—capable of melting steel columns quietly in secret. Truthers now claim that both red-gray chips and iron-rich microspheres in WTC dust can *only* be explained by thermite, thus providing a "smoking gun" that proves their inside job/controlled demolition hypothesis.

A new report on studies of dust from the destruction of the Twin Towers has been released. The report by James R. Millette, PhD, of Georgia is titled "Progress Report on the Analysis of Red/Gray Chips in WTC Dust."[1] Journalist Chris Mohr, who has a whole series of YouTube videos about 9/11 conspiracy theories, commissioned the study; members of the James Randi Educational Foundation (JREF) helped raise funds for the study, which was issued February 29, 2012.

The study took another look at samples of WTC dust, which Niels Harrit of Denmark and several others (including Steven Jones) purport contains nanothermitic materials ("Active Thermitic Material Discovered in Dust from the 9/11 World Trade Center Catastrophe," *The Open Chemical Physics Journal*).

Millette's conclusion contradicts that claim: "The red/gray chips found in the WTC dust at four sites in New York City are consistent with a carbon steel coated with an epoxy resin that contains primarily iron oxide and kaolin clay pigments. *There is no evidence of individual elemental aluminum particles of any size in the red/gray chips, therefore the red layer of the red/gray chips is not thermite or nanothermite.*"

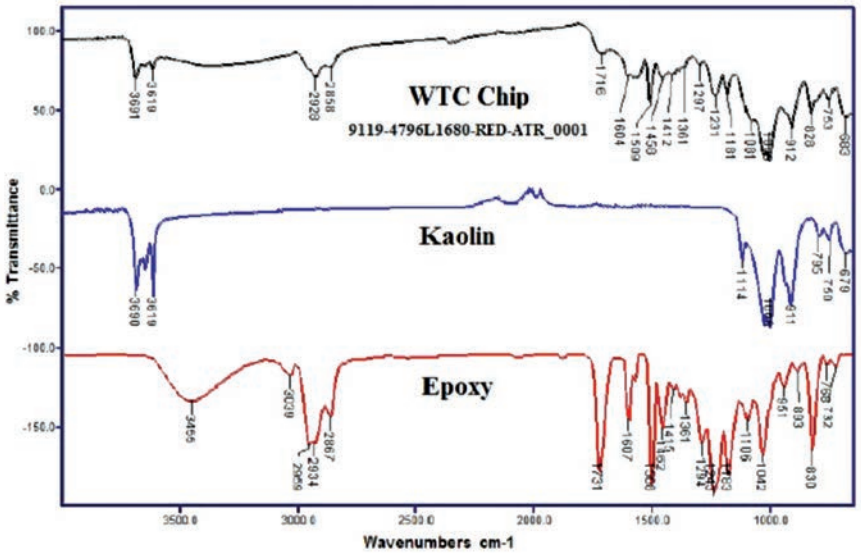
If these chips aren't thermite, then what are they? Millette performed several tests, including Fourier transform infrared spectroscopy (FTIR), on the chips and clearly showed that the chips are a mixture of kaolin and epoxy. Kaolin, also called aluminum silicate and china clay, is a platy mineral frequently used as a pigment in paints. Epoxy resins have been used in coatings since the 1940s.

Whatever the chips are, they are *not* thermite, as particles of elemental aluminum are as crucial to thermite or nanothermite as heat and oxygen are to fire. No aluminum, no thermite.

On a related note, in February 2012 I posted a letter[2] from Rich Lee of the R.J. Lee Group on the JREF Forum. This company's post-9/11 2003 report on WTC dust samples mentioned microscopic spheres of iron, which 9/11 Truthers have long maintained could *only* have been formed with thermite, thus proving their controlled demolition/inside job claim. Ron Wieck, who produces an Internet debate program called *Hardfire*, recently asked the R.J. Lee Group to clarify what they thought about the iron microspheres. Rich Lee himself answered (in part):

> What about the iron microspheres? The iron has a thin layer of rust flakes that can be easily removed by sticky tape. The iron is heated red hot or hotter and subjected to hurricane force blast furnace like wind. The iron flakes are liberated as small particles and some iron is vaporized. Like drops of water, the iron flakes form molten spheres that solidify and the fume also condenses into spheres, the most efficient geometrical form. . . . *The formation of iron and other type spheres at temperatures obtainable by the combustion of petroleum or coal based fuels is not a new or unique process.* These spheres are the same as iron and alumino-silicate spheres in the well-studied fly ash formed from contaminants in coal as it is burned in furnaces. (emphasis added)

The answer to the mystery of the microspheres (i.e., "Iron melts only at temperatures much higher than possible in



Millette's FTIR plot shows that the chips in WTC dust are likely a mixture of kaolin and epoxy, both common ingredients in paints and coatings.

normal fires, so how could microspheres have possibly been formed on 9/11?") is simply that *very small metal particles have much lower melting points* than their bulk material counterparts (around 900° C for iron nanoparticles, as opposed to 1535° C for bulk iron). This is called the "thermodynamic size effect." The towers contained thousands of computers and electric gadgets. Wires and filaments and meshes from electronics, as well as thin rust flakes and other small iron particles, could all have easily been made into microspheres during the WTC conflagration. To see a vivid demonstration of this phenomenon, watch the video[3] on the New Mexicans for Science and Reason's YouTube channel, "theNMSR," in which a normal lighter is used to burn steel wool, creating numerous iron microspheres without any thermite at all!

For now, two principal claims of the 9/11 Truth movement—that scientists found thermite residues in WTC dust and that iron microspheres in WTC dust prove that thermite was used—have both been found to have no basis in fact.

Notes

1. Millette study online: http://dl.dropbox.com/u/64959841/9119ProgressReport022912_rev1_030112webHiRes.pdf.
2. R. J. Lee letter online: http://forums.randi.org/showpost.php?p=8013472&postcount=1329.
3. Dave Thomas "Microspheres from Steel Wool" video: http://www.youtube.com/watch?v=jZ9wSD4Hcys.

Dave Thomas, a physicist and mathematician, is president of New Mexicans for Science and Reason and a fellow of the Committee for Skeptical Inquiry. He is currently a scientist/programmer at IRIS/PASSCAL in Socorro, New Mexico, and also teaches classes in physics, psychology, and critical thinking at New Mexico Tech. He wrote "The 9/11 Truth Movement: The Top Conspiracy Theory, a Decade Later" in the July/August 2011 SI.

Placebo Bands Help Fund Grassroots Skepticism

GURMUKH MONGIA

The skeptical movement is, at its heart, a system of small grassroots organizations. While there are a few large players, most activity comes from small groups of friends acting at the local level, or even individuals acting on their own, to encourage skepticism and critical thinking.

It should come as no surprise that small organizations may experience difficulty raising the funds needed to engage in certain forms of skeptical activism. Even professional-looking flyers can be a little difficult to come by, especially in a time when economic instability creates tight budgets and strict priorities.

Two skeptical entrepreneurs have taken steps to address this lack of funding in grassroots skepticism. Christo-

Measles Cases Up Sharply in U.S.

Measles cases in the United States hit a fifteen-year high in 2011, with 90 percent of the cases traced to other countries that have lower immunization rates, according to the Centers for Disease Control and Prevention's Morbidity and Mortality Weekly Report in April.

Between 2001 and 2010 there had been only about sixty cases of measles per year, but in 2011 the U.S. experienced 222 cases. No one has died of measles in the United States, but about twenty million people contract the measles virus each year worldwide, and about 164,000 die from it, said Anne Schuchat, MD, director of the CDC's National Center for Immunization and Respiratory Disease.

All but twenty-two of the 222 cases last year involved patients who had been infected overseas or caught the virus from someone who had been abroad, the CDC said. The source of the other twenty-two cases could not be determined.

Many of the cases were traced to Europe, where in some countries immunization rates are lower than in the United States. Europe suffered an outbreak of the disease in 2011, reporting more than 37,000 measles cases. France, Italy, and Spain, popular destinations for U.S. tourists, were among the hardest hit.

More than 90 percent of U.S. children have been vaccinated against measles, the CDC said.

"We don't have to have this much measles," Schuchat said. "Measles is preventable. Unvaccinated people put themselves and other people at risk for measles and its complications."

The World Health Organization (WHO) launched a week of vaccination campaigns and public education touting the value of immunizations. It said that with increased immunizations worldwide, global measles mortality has declined by 78 percent from 733,000 deaths in 2000 to 164,000 deaths in 2008. Nevertheless, WHO estimated that 19.3 million children under the age of one—more than half of them in Africa and Southeast Asia—did not receive the diphtheria-tetanus-pertussis (DTP3) vaccine.

pher Brown of the podcast *Meet The Skeptics* (meettheskeptics.libsyn.com) and Travis Roy of the Granite State Skeptics (granitestateskeptics.org) have joined together to become the North American distributors of the popular Placebo Band (placebobandstore.com).

Brown and Roy wanted the proceeds from their sales to go toward some form of social good. They donated the proceeds from their first batch of sales to the charity Autism Speaks. Now they're looking for some grassroots skeptical causes to support, and they've already participated in two very worthy ventures.

When SKEPTICAL INQUIRER Deputy Editor Ben Radford wanted to protest Sylvia Browne's performance in Albuquerque, New Mexico, last year by printing up a pair of large vinyl banners informing the public of Browne's criminal record, Placebo Band North America, among other private donors, promptly contributed to the cause, defraying some of the project's costs.

Brown and Roy also responded to a request for funds to help create and distribute a skeptical book for children by Kitty Mervine, who contributes to the *She Thought* blog (shethought.com) and advocates scientifically based support for people who believe they've been abducted by aliens through her Bad Alien website (badalien.org). Mervine has also written a number of skeptical stories for children ages three to five, a market that she believes is underrepresented in skeptical children's literature. One story from the book, "Otterly-Impossible," tells the story of three otters that love to swim in such a way that they are often mistaken for a sea monster. Placebo Band North America donated to Kitty's efforts, distributing copies of her book for free to children attending skeptic camp.

Now Brown and Roy are looking for more grassroots skeptical projects to become involved with. Anyone who knows of a local skeptical organization or individual that could use a small donation for a specific activity related to skeptical activism is encouraged to contact either Christopher Brown (meettheskeptics@aol.com) or Travis Roy (travis@granitestateskeptics.org) with a full explanation of the project, including its overall goal and a list of the project's participants. Placebo Band North America will consider all requests and will be happy to donate their money to a worthy cause.

Gurmukh Mongia is a computer scientist working in the field of web development. He is a graduate of Niagara College of Applied Arts and Technology, where his interest in critical thinking led him to take additional courses in statistics and public disinformation. He currently operates a blog and podcast related to critical thinking, The Dumbasses Guide To Knowledge (www.dumbassguide.info).

Capital Punishment Research Inconclusive, NRC Reports

Research to date on the effect of capital punishment on homicide rates is not useful in determining whether the death penalty increases, decreases, or has no effect on these rates, says a new report released April 18 from the National Research Council.

The committee that wrote the report evaluated studies conducted since a four-year moratorium on the death penalty was lifted in 1976; it found that the studies do not provide evidence for or against the proposition that the death penalty affects homicide rates. These studies should not be used to inform judgments about the effect of the death penalty on homicide and should not serve as a basis for policy decisions about capital punishment, the committee said.

The lack of evidence about the deterrent effect of capital punishment—whether it is positive, negative, or zero—should not be construed as favoring one argument over another, the report stresses. "Fundamental flaws in the research we reviewed make it of no use in answering the question of whether the death penalty affects homicide rates," said Daniel S. Nagin, the Teresa and H. John Heinz III University Professor of Public Policy and Statistics at Carnegie Mellon University and chair of the committee that wrote the report.

Anti-Evolution Bill Becomes Law in Tennessee

A bill that encourages teachers to present the "scientific strengths and scientific weaknesses" of topics that arouse "debate and disputation," such as "biological evolution, the chemical origins of life, global warming, and human cloning" has now become law in Tennessee.

Scientists and science educators see such bills as thinly disguised attacks on evolutionary science and other scientific topics that trouble religious conservatives.

The bill became law April 10, 2012, without the governor's signature. Governor Bill Haslam declined to sign it, expressing reservations about its value, but apparently realized a veto would be overridden by a majority vote in both chambers. The bill had passed both chambers by a 3-to-1 margin.

Haslam said in a statement:

> I have reviewed the final language of HB 368/SB 893 and assessed the legislation's impact. I have also evaluated the concerns that have been raised by the bill. I do not believe that this legislation changes the scientific standards that are taught in our schools or the curriculum that is used by our teachers. However, I also don't believe that it accomplishes anything that isn't already acceptable in our schools.... Good legislation should bring clarity and not confusion. My concern is that this bill has not met this objective. For that reason, I will not sign the bill but will allow it to become law without my signature.

The bill had been opposed by the state's major newspapers and state and national civil liberties, educational, and scientific groups.

"Telling students that evolution and climate change are scientifically controversial is miseducating them," said Eugenie C. Scott, executive director of the National Center for Science Education. "Good science teachers know that. But the Tennessee legislature has now made it significantly harder to ensure that science is taught responsibly in the state's public schools."

Why the GOP Distrusts Science

It's not just evolution and climate change—conservatives' trust in science is plummeting across the board.

CHRIS MOONEY

For a long time, those of us who monitor the troubled relationship between science and the American public had at least one thing we could feel good about. And that was knowing that while we might argue endlessly over global warming or the teaching of evolution, at the end of the day Americans in general still expressed strong confidence—strong trust—in the institution of science and its leaders. Spats over a handful of divisive issues didn't seem to have soured them on science across the board.

The evidence for this came in the form of polling data from the General Social Survey, which for decades has asked people to rate their level of confidence in the leaders of a variety of institutions. Even at a time of declining trust in institutions in general, science always seemed to fare pretty well by this metric. "In 2008, more Americans expressed a 'great deal' of confidence in scientific leaders than in the leaders of any other institution except the military," noted the National Science Foundation's 2010 *Science and Engineering Indicators* report, which serves as a clearinghouse for these sorts of public opinion findings.

This spring, however, such claims seemed to all but fall apart.

In a new study published in the *American Sociological Review* ["Politicalization of Science in the Public Sphere: A Study of Public Trust in the United States, 1974-2010," *ASR*, 77(2): 167–187, 2012], Gordon Gauchat of the University of North Carolina–Chapel Hill analyzed responses to this "confidence in institutions" question—which has been asked since 1974—based on the political ideology of the respondents. And in doing so, he found

that confidence in the scientific community had declined quite dramatically among self-described U.S. political conservatives. This downward trend in the data, says Gauchat, had previously been hidden by "not breaking out the political part of it"—by treating all Americans as a uniform group.

And not only did Gauchat find that, from 1974 to 2010, conservatives marched away from the scientific community. He also found, quite disturbingly, that this had a surprising and paradoxical relationship with their levels of education. It turns out that it was the educated conservatives who became the most distrusting of science over time—a phenomenon that I have called the "smart idiot" effect, and that likely reflects their higher level of political knowledge and engagement. Liberals, in contrast, remained relatively uniform in their trust in science over the period.

In one sense, I suppose I should be gratified by these results: Gauchat explicitly set out to test the thesis of my 2005 book *The Republican War on Science*, and writes that his results provide "strong evidence" in my favor. (Not that this is the sort of thing that you want to be right about.) But how do we explain this occurrence—this big move, by conservatives, away from science?

Just as I did in *Republican War*, Gauchat points the finger at the rise of the "New Right" as a political movement in the 1960s and 1970s. He underscores how upstart conservatives generated their own alternative sources of expertise—in other words, created their own version of reality, scientific and otherwise—at think tanks like the Heritage Foundation and Cato Institute. The goal was to hit back against liberal academia, as well as the intellectuals and scientists who worked there.

At the same time, conservatives also forged an alternative media universe—centered on Fox News and Rush Limbaugh's radio show—where scientists often fell under attack on a key set of politicized issues like global warming, evolution, embryonic stem cell research, and many others.

The idea, then, is that conservatives came to define the worlds of science and academia as a liberal domain that was biased against them—one they had to actively combat by generating their own sources of "counter-expertise." And naturally, this led to decreased trust in scientists and their institutions, especially among the most politically attuned conservatives, who were most familiar with the nature of these battles, and tracked them most closely.

Sounds plausible enough—but is that the full story?

There's no doubt it's partly true; but in recent years, I've come to question whether it is a complete account. In particular, in my new book, *The Republican Brain,* I emphasize that beyond such surface-level political and sociological explanations, we also have to examine the powerful sub-surface psychological determinants of political behavior. Really, you need both types of explanations, combined, before you can understand many political phenomena.

In a psychological sense, there are many reasons to think that self-described political conservatives today are just different people than they were in 1974—more rigid, more closed-minded. Consider, for instance, the work of political scientists Marc Hetherington of Vanderbilt and Jonathan Weiler, also of the University of North Carolina–Chapel Hill. In their 2009 book *Authoritarianism and Polarization in American Politics* (Cambridge University Press) Hetherington and Weiler show that the United States became not only more politically divided, but also more psychologically divided, during the time period in question.

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The chief catalyst for this development was Nixon's infamous "Southern Strategy" and the rise of an array of "culture war" issues during the 1960s and 1970s. As a result of these forces, Hetherington and Weiler explain, a group of people called "authoritarians"—a generally conservative personality type characterized by cognitive rigidity, viewing the world in black-and-white terms, and holding fixed beliefs, often fundamentalist Christian ones—became much more

"It is error only, and not truth, that shrinks from inquiry."
– Thomas Paine

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strongly clustered in the Republican Party, and the conservative movement, than they had been previously.

In other words, the "conservatives" analyzed in Gauchat's study seem to have changed psychological identities over time. According to Weiler, "those self-identifying as conservative have been increasingly likely to be authoritarians over the past generation."

This occurred for a number of reasons, Weiler explains. Concerted attacks on "liberalism" pushed working-class whites—once supportive of the New Deal—away from embracing that label; instead, the term came to be more associated with the civil rights struggle, and later, with women's rights and gay rights. At the same time, the political mobilization of conservative Christians—many of them authoritarians—helped draw a much stronger linkage between calling oneself a "conservative" and embracing religious fundamentalism. "As liberalism and conservatism came to be redefined," explains Weiler, "authoritarians had reason to gravitate much more readily toward one ideological camp, and one political party."

So under this theory, it's not just that movement conservatives built think tanks that allowed for an end-run around scientific expertise. And it's not just that they constantly attacked academia, where liberals and scientists were clustered. It's also that people inclined to view the world in black and white terms increasingly came to call themselves "conservative" in the first place.

How does psychological authoritarianism set the stage for a distrust of science? If you see the world in an authoritarian way, then you're more likely to dismiss your ideological opponents (scientists or otherwise) without compromise—to define them as an out-group, an "other." At the same time, you're also less likely to appreciate the nuanced, measured style of thinking and writing that is so typical of scientists (and for that matter, liberals). It just won't feel right to you. Authoritarians are known for their intolerance of uncertainty; yet uncertainty is the lifeblood of science.

If you see the world in an authoritarian way, then you're more likely to dismiss your ideological opponents (scientists or otherwise) without compromise—to define them as an out-group, an "other."

And indeed, if you look at the Tea Party today—a highly authoritarian group of people, according to Hetherington and Weiler—this is exactly what you see. Take the issue of global warming. Not only do Tea Partyers dismiss the overwhelming body of science showing that humans are causing it; polling data from the Yale Project on Climate Change Communication (http://environment.yale.edu/climate/news/PoliticsGlobalWarming2011/) also show they're confident they don't need any more information about the issue. They're not just wrong, then; it's considerably worse than that. They're wrong and also sure of themselves.

It is important to acknowledge that authoritarianism refers to a psychological trait or disposition, not an explicit ideology. At least theoretically, it's content neutral. So it's conceivable that in a very different political context, authoritarians might well have lined up behind science, rather than against it. That would be an odd political case, though; especially in a democracy, it's not very likely that authoritarianism and science will get along very well together, any more than that authoritarianism and liberalism will go together. They're just such deeply opposed ways of thinking—and being. You could argue that the clash between science and authoritarianism dates all the way back to the time of Galileo, if not farther.

Gauchat's findings are the farthest thing from heartening—especially when combined with Hetherington and Weiler's. But together, they do give us an opportunity to examine the root causes of the ideological war on science now being prosecuted by political conservatives in the U.S. You can't begin to address a problem until you find its source. And in this case—as in so many others—that source appears to lie in both politics and also psychology, combined.

Chris Mooney, a Skeptical Inquirer contributing editor and Committee for Skeptical Inquiry scientific consultant, is author of four books, including *The Republican War on Science*. This article, which first appeared on salon.com, is based on arguments developed fully in his latest book, *The Republican Brain: The Science of Why They Deny Science—and Reality*, published in April.

Joe Nickell, PhD, is CSI's senior research fellow and author of such books as *Inquest on the Shroud of Turin*, *Relics of the Christ*, and *Looking for a Miracle*.

Enfield Poltergeist

In August 1977, a series of disturbances that were soon characterized as a case of poltergeist phenomena or even demonic possession began in Enfield, a northern suburb of London. The subject of a forthcoming movie, the occurrences, including the actions of an eleven-year-old girl who repeatedly "levitated" above her bed, "held the nation spellbound" for over a year, according to Britain's *Daily Mail*; "no explanation other than the paranormal has ever been convincingly put forward" (Brennan 2011).

A female police constable witnessed a chair wobble and slide but could not determine the cause of the movement. By the next morning, marbles and Lego toy pieces began to "zoom out of thin air and bounce off the walls."

"Janet, did you throw that?" Her mother's question began a long series of witnesses' suspicions—or outright accusations—that Janet was the cause of the trouble that centered on her. According to Guy Lyon Playfair—who, with colleague Maurice Grosse, observed and recorded much of the phenomena over their course—Janet was the "main focus" or "epicentre" of incidents. "She was always near when something happened, and this inevitably led to accusations that she was playing tricks, although Grosse was already fully convinced that she could not be responsible for *all* the incidents" (Playfair 1980, 37).

The poltergeist tended to act only when it was not being watched. Stated Grosse: "It's smarter than we are…."

Suspicious Acts

The events began on August 30 in the Enfield home of Margaret Hodgson. The divorced Hodgson lived there with her four children—Peggy, thirteen; Janet, eleven; Johnny, ten; and Billy, seven—whose names, in early accounts, were fictionalized. Two of the children, Janet and Johnny, attempted to convince their mother that their beds were unaccountably shaking. The next night brought mysterious knocking sounds and the sliding of a chest of drawers in the girls' room. There were more knockings, and soon Hodgson had a police car making a call to 284 Green Street (Playfair 1979; 1980, 12–33).

Was her sister, Peggy, partly to blame? Although Janet was by far the most frequently present suspect, with disturbances even following her to school, her older sister was also central to some events. Once, for example, when Peggy shouted, "I can't move! Something's holding me!" she was found on the stairs with one leg extended behind her in a manner that could easily be explained as play-acting. She was also involved in other incidents, and when on one occasion the girls were separated (with Peggy sent to a neighbor's home), the antics continued at both houses; moreover, when neither girl was present—for example when Playfair spent a night alone in the house—there were no disturbances at all (1980, 80). Were both girls playing tricks, or could the poltergeist be in two places at once? When Janet was in the hospital for six weeks for evaluation, some incidents occurred only at home (Playfair 1980, 69, 90, 102, 263).

Still, says Playfair,

> Janet was all energy, big for her age, jumping up and rushing around on the slightest pretext, and talking so fast that I had some difficulty at first in understanding her. She had an impish look, and I could understand why some visitors to the house in the later months would suspect her of playing tricks. (1980, 44)

Children's Tricks

Even Playfair himself, who chronicled the events in his book *This House is Haunted: The True Story of a Poltergeist* (1980), had occasional doubts. After a chest of drawers tipped and jammed at an angle against a wall, Playfair played his tape recorder and heard suspicious creaking noises, as if someone like Janet had slipped up to the chest. "Could they have been made by her?" Playfair asked. "I was beginning to have my doubts again" (1980, 52).

There were reasons aplenty for suspicion. The poltergeist, a.k.a. "The Thing," tended to act only when it was not being watched. Stated Grosse: "It's

smarter than we are. Look at its timing—the moment you go out of a room something happens. You stay in the room for hours, and nothing moves. It knows what we're up to" (Playfair 1980, 53). Indeed, when Janet knew a camera was on, nothing occurred (1980, 53). Incredibly, Playfair and Grosse found that the children were sometimes "motivated to add to the activity with some tricks of their own." When members of the Society for Psychical Research (SPR) made visits, the children's trickery was the main feature of their interest, whereas, says Playfair, "it did not bother us very much. We had already seen incidents with our own eyes that the children could not possibly have done deliberately" (1980, 70). (More on this presently.)

The incidents involving "curious whistling and barking noises coming from Janet's general direction" suggest the extent of Playfair and Grosse's credulity. In time, the entity began to voice words, including obscenities, and although Playfair wondered if it were really Janet acting as "a brilliant ventriloquist," he did not think so. His faith in Janet continued even though "the Voice" *refused to speak unless the girls were alone in the room with the door closed* (Playfair 1980, 138, 146). Moreover, the credulous investigators noted that, when the growling voice occurred, "as always Janet's lips hardly seemed to be moving" (1980, 190).

Evidence of ventriloquial fakery was even taken as proof of authenticity! According to Playfair, "The connection between Janet and the Voice is obviously very close. There have been several occasions when she says something it obviously meant to say, and vice versa. Would she slip up like that if she was faking the whole thing?" (1980, 173).

Is he kidding? Even after professional ventriloquist Ray Alan visited and concluded that the girls were producing the Voice because they "obviously loved all the attention they got," Playfair and Grosse were not persuaded that the girls were faking. In fact, they were quick to claim that even if the girls faked the Voice, the other mysterious happenings remained unexplained (Playfair 1980, 233).

This remained Playfair's and Grosse's defense even when Janet was caught at trickery (Playfair 1980, 196–7) and when Janet and Peggy confessed their pranking to reporters. The two investigators soon elicited a retraction from the girls (1980, 218–21). Others, such as the professional ventriloquist, were not so quick to rationalize.

Anita Gregory, who was investigating for the SPR, reported on the events in the *Journal of the Society for Psychical Research*. She suggested that the case had been overrated, describing several episodes of behavior on the part of Janet and Peggy that were revealing. Gregory concluded that the girls were *nonpsychically* responsible for many of the incidents that were attributed to "poltergeist" phenomena. Although she thought the outbreak *might* have originated paranormally (Gregory was a British parapsychologist inclined to believe in the paranormal), she concluded it had turned quickly into a farcical performance for investigators and reporters desiring a sensational story (Gregory 1980; Clark 1981).

Even more skeptical was American magician Milbourne Christopher, who investigated briefly at the house. On one occasion, when Janet claimed she was unable to open the bathroom door to get out, Christopher stated that he could not determine paranormal causality if he could not see an incident. Playfair writes, "It almost seemed that the poltergeist was out to incriminate her, by producing third-rate phenomena in the presence of a first-rate observer" (1980, 170). Another time, when Janet was sent to her room and the Voice manifested, Christopher slipped upstairs to observe. He saw Janet quietly steal out of her room to peer down the stairs as if to make sure she was

Figure 1. An eleven-year-old girl is supposedly levitating during the poltergeist outbreak of 1977–79 in Enfield, England. (Forensic illustration by Joe Nickell based on a photo in *This House Is Haunted*, 1980.)

not being watched. Seeing Christopher clearly flustered her. Christopher would later conclude that the "poltergeist" was nothing more than the antics of "a little girl who wanted to cause trouble and who was very, very, clever" (1984–85, 161).

Paranormal investigator Melvin Harris also weighed in on a fast photo sequence that supposedly "recorded poltergeist activity on moving film for the first time" (Playfair 1980, 106). Harris (1980) demonstrated how the photos actually reveal the schoolgirls' pranking. While demonologist Ed Warren claimed that Janet at least once was "sound asleep, levitating in midair" (Brittle 1980, 223), the photographs did not record these levitations nor did independent witnesses see them. Warren was notorious for exaggerating and even making up incidents in such cases, often transforming a "haunting" case into one of "demonic possession" (Nickell 2009). Harris dubbed the photographed levitations "gymnastics," commenting, "It's worth remembering that Janet was a school sports champion!" (1980, 554). (See Figure 1.)

History's Verdict

By 1979, the Enfield "poltergeist" had left the Hodgson home "inexplicably," except for an occasional isolated incident. The motivating force—we may suspect tension in the household following the parents' divorce—eventually ran its course. But the question remains: Is it true that Janet and the other children really could not have caused certain disturbances, as Grosse and Playfair insisted? Let us look at just one instructive incident. Maurice Grosse reported that "[the poltergeist] just threw a slipper while we were all in the room. It was not within the reach of the children, it was down near the end of the bed" (Playfair 1980, 82).

However, all that would have been necessary would be for Janet, say, to have *earlier* gotten hold of the slipper and then waited for the proper moment—when Grosse was not looking at her—to toss it. Time and again in other "poltergeist" outbreaks, witnesses have reported an object leaping from its resting place supposedly on its own, when it is likely that the perpetrator had secretly obtained the object sometime earlier and waited for an opportunity to fling it, even from outside the room—thus supposedly proving he or she was innocent.

As a magician experienced in the dynamics of trickery, I have carefully examined Playfair's lengthy account of the disturbances at Enfield and have concluded that they are best explained as children's pranks. The principle of Occam's razor—that the explanation requiring the fewest assumptions is the best one—well applies here. Interviewed by the London *Daily Mail* (Brennan 2011), Janet at age forty-five (living in Essex with her husband, a retired milkman) admitted that she and her sister had faked some of the phenomena. "I'd say 2 percent," she admitted. The evidence suggests that this figure is closer to 100 percent; however, as another eleven-year-old girl insisted after confessing to playing poltergeist to attract attention in an earlier case: "I didn't throw all those things. People just imagined some of them" (Christopher 1970, 149). ■

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Acknowledgments

Barry Karr, CFI's executive director, tipped me to the forthcoming 2012 movie being made about this case (which I had discussed briefly in my book *Entities*), and Timothy Binga, director of CFI Libraries, assisted with research.

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[THINKING ABOUT SCIENCE MASSIMO PIGLIUCCI

Massimo Pigliucci is professor of philosophy at the City University of New York–Lehman College, a fellow of the American Association for the Advancement of Science, and author of *Nonsense on Stilts: How to Tell Science from Bunk*. His essays can be found at www.rationallyspeaking.org.

Explanations in Search of Observations

Many scientists use models to help make sense of what they study. Think of the Copernican model of the solar system, econometric models, or the famous Watson-Crick model of the double helix that constitutes the standard arrangement of DNA molecules. A great deal of discussion in philosophy of science has been devoted to what, exactly, models are and what their role in scientific theorizing is. This is a complex issue, one that gives interesting insight into the way science works and, conversely, the way pseudoscience does not.

I was reminded of this discussion recently while reading a paper by Robert Sugden published in the September 2011 *Biology and Philosophy*. Sugden explores in detail the structure and use of three models—one from econometrics and two from evolutionary biology—as an entry into a discussion of two alternative conceptions of the purpose of models.

Sugden draws his examples from Thomas Schelling's model of racial segregation, John Maynard Smith and Geoffrey Parker's model of "evolutionary stable strategies" that reduce conflict among animals competing for mates, and Nicholas Barton's model of the dynamics of hybridization between closely related species that come into geographical proximity to each other. Fortunately, we do not need to get into the details of these works to appreciate Sugden's main point and what it may say about the nature of scientific theorizing.

These models all produce what Sugden calls "explanations in search of observations." That is, in all three cases the authors start out by building a highly abstract rendition of whatever problem they are interested in (racial segregation, animal competition, or inter-species hybridization) and then explore the properties of the resulting models. In so doing, they discover some features that are displayed by the model but not, as far as they know, by the real world. Sugden suggests that these are cases in which the process of modeling has produced an "explanation" even though there was not a corresponding previously known observation to explain.

This may seem a bit bizarre. After all, if scientists produce models (and theories) it is because they wish to explain some natural phenomenon; coming up with an explanation that needs an observation to explain feels a lot like putting the cart before the horse. Indeed, philosopher Nancy Cartwright, quoted by Sugden, has a problem with many econometrics models precisely because they do put the explanans (the thing that does the explaining) before the explananda (the things to be explained). According to Cartwright, this is not how models in science are supposed to work—for examples of how they *are* supposed to work, Cartwright points to law-like idealizations in physics, such as Galileian models of the behavior of objects moving on frictionless planes.

Cartright's problem with models doesn't trouble Sugden, though, because he prefers another philosopher's account of models. Richard Giere has proposed that a scientific theory just *is* a set of models and that those models produce hypotheses that link them to what's going on in the real world. In this manner, a hypothesis can be seen as a theoretical construct that asserts a similarity between the model and the real world, and it doesn't really matter whether that similarity is recognized before or after a given observation is carried out in the world.

Are any of these propositions of interest to the skeptic involved in fighting pseudoscience? I think so. When pseudoscience supporters talk about "theory" they clearly have no idea what a scientific theory actually is and how it works. Unfortunately, the concept of theory becomes difficult to explain if the skeptic himself doesn't have an account—as philosophers call it—of scientific theorizing. Giere's account is particularly promising because it is flexible enough to apply to a range of disciplines, from physics to biology, from economics to psychology. Where it clearly doesn't apply is, for instance, intelligent design "theory," or any explanation (such as it is) of how paranormal phenomena allegedly work.

So a major difference between science and pseudoscience is precisely the fact that science isn't simply a collection of observations and experiments about the world; it is also an activity that produces abstract and idealized *models* of possible worlds, linking them to the real one via a set of specific and empirically testable hypotheses. That is not to say that some pseudo- or quasi-science may not one day be able to produce such models and hypotheses. But until it does, it cannot seriously be considered a science.

Massimo Polidoro is an investigator of the paranormal, lecturer, and cofounder and head of CICAP, the Italian skeptics group. His website is at www.massimopolidoro.com.

Stairway to Heaven

A Firsthand Account of a UFO Sighting

It was a nice mid-June afternoon. The sun was shining and I was enjoying solitary tranquility on the balcony of a country house in Pordenone in northern Italy. Birds chirped and the sky was blue; not a single cloud could be seen in the vicinity. Suddenly, I saw something unusual up in the sky. By instinct I thought of a bird or a plane, but it didn't seem to be anything of the kind.

In fact I was watching something quite impossible: up there, in the middle of the sky, was what appeared to be a three-stepped black ladder. The notes of the poetic song "Stairway to Heaven" by Led Zeppelin and the melodic "Stairway to Paradise" by Gershwin instinctively came to mind, but I doubted that I was actually looking at a true stairway to the sky.

The mysterious three-stepped stair seen by the author in the sky of Pordenone.

Here is the stair upside down; its shape becomes more easily recognizable.

It seemed incredible, but that mysterious object hovered there—I don't know how far from the ground—perfectly still. I was going to call somebody to confirm that what I was watching was real and that I was not imagining it; as soon as I started moving, however, the stairway appeared to get shorter and shorter until it suddenly vanished into thin air.

What the heck had I seen? What I knew about UFOs at the time was that when someone spotted one, they always described it as a roundish object, a "saucer," or a sphere- or cigar-shaped vessel of some kind. But UFOs resembling a three-stepped stairway? I had never heard of such a thing.

Yet there was no doubt in my mind that I saw an unidentified flying object. At the time—it was the early 1980s—there was no Internet; the only way in which you could learn more about the subject was to read books or ask the opinion of a friendly UFO enthusiast. That's exactly what I did, but that didn't lead anywhere. The mysterious steps in the sky did not seem to have any possible rational explanation, and for years I carried with me the memory of that absolutely impossible sight.

An 'Invisible' Solution

It was only during the first Iraq war in the early 1990s that things got clearer. At that time, in fact, it became known that the U.S. Air Force was in possession of a revolutionary "invisible" aircraft, the B2 Spirit. It was the first plane with a "stealth" technology that could render the carrier invisible to radars. It all depended on the particular shape of the fighter, a shape that quickly became an icon of modern aeronautic design.

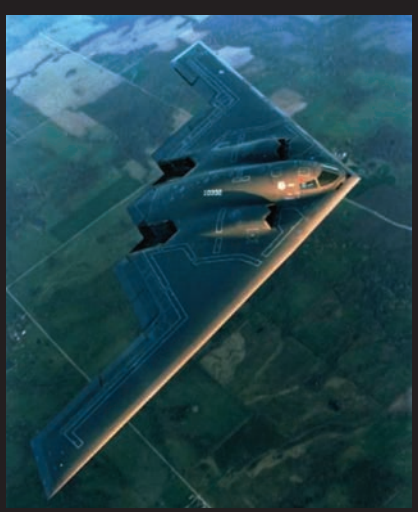
When, finally, I had a chance to look at a picture of the B2 Spirit everything fell into place and I could at last solve the mystery of the stairway to heaven. The plane had a sharp line and a flat body, united in a solid block with the wings in order to create a triangle-shaped body, with the tail also ending in a wedge—an ad hoc design studied by engineers. That particular shape, in fact, was able to offer a radar surface of 0.003 meters, similar to that of a swallow. This shape helped the fighter escape radar detection.

The fact is that if you see it from above, the plane looks exactly like a three-stepped stairway. If you see it in backlight as well, like I had, it would appear to be black and it would be impossible to discern any of the details of the craft. Finally, the impression that it was standing still was an illusion due to the fact that, probably, when I saw it the plane was turning around and, when it turned on its axis, the effect was for it to get smaller and smaller. The final disappearance without a trace was due to the fact that it was a subsonic plane, with two turbo fans and no afterburner—meaning the craft left no vapor trails.

There was one last peg that needed to be put in place: how plausible was it for an American stealth combat airplane to fly above Pordenone? The answer is very likely, since near Pordenone, in Aviano, there was (and still is) a NATO base managed by the U.S. Air Force. There is no doubt, then, that in the early 1980s, after the invention of such a carrier, some military exercises were taking place in the sky above Pordenone.

Once I was able to solve this mystery, the episode clarified for me how it was possible for a rational, sober person to be convinced, in perfectly good faith, that he or she had witnessed a UFO sighting. An alternative explanation existed, but it was not available to the public at the time. Had I not learned about the existence of stealth planes, I might still be here today wondering what in the world that little stairway in the sky had been. And who knows how many other military experiments, successful or not, have taken place above our heads. We will probably never know. . .

The planes flying beside the triangular shape now make much clearer the nature of the object.



The solution to the mystery: the stair was a B2 Spirit, a stealth plane "invisible" to radars, unknown to the public at the time of the sighting.

[PSYCHIC VIBRATIONS ROBERT SHEAFFER

Sheaffer's "Psychic Vibrations" column has appeared in the SKEPTICAL INQUIRER for more than thirty years; its highlights have now been published as a book (Create Space 2011). Sheaffer blogs at www.BadUFOs.com, and his website is www.debunker.com.

Flying Saucer or Fly: The Case UFO Skeptics Have Been Dreading?

On March 13, 2012, the well-known UFOlogist Leslie Kean wrote a story for the *Huffington Post* titled "UFO Caught On Tape Over Santiago Air Base" (http://tinyurl.com/KeanChile). Kean is also the author of the 2011 *New York Times* best seller *UFOs: Generals, Pilots, and Government Officials Go On the Record* (see my review "'Unexplained' Cases—Only If You Ignore All Explanations," SI, March/April 2011, now online at http://www.debunker.com/texts/kean.htm). Kean's most recent article describes a supposed UFO caught on video during a November 5, 2010, air show at the El Bosque airfield in Chile (although nobody at the air show saw the supposed UFO until it was spotted in the video afterward). CEFAA—the Chilean Air Force's equivalent of the USAF's disbanded Project Blue Book—provided the video. The El Bosque video was said to have been subjected to "intense scrutiny" by a panel of "scientists from many disciplines, aeronautical experts, and Air Force and Army photogrammetric technicians," all of whom found the video unexplainable. (Kean is very impressed by panels of supposed "experts" no matter what foolish things they might say, like the French COMETA, which fellow UFO proponent John Alexander called "an embarrassment . . . [that uses] unsubstantiated data from questionable sources.") Kean asks provocatively, "Is this the case UFO skeptics have been dreading?" She obviously thought she had an extremely strong UFO case here considering that she provided the video exactly as released by the Chilean CEFAA (http://tinyurl.com/ChileUFO).

Kean claims that the object was captured on seven different videos by seven different people, each from a different vantage point. However, the video released seems to represent just one of the seven videos, and even that one video is not complete; instead we see only some carefully chosen snippets. (She later cautioned, "You can't draw conclusions from looking at only one tape.") Moreover, the video was released only in a highly compressed ten frames-per-second version instead of the standard twenty-four frames per second. Somebody seems to have been "stage managing" this case to let us see only certain portions of the "evidence." Kean said, "Each video included three different, mainly horizontal loops flown by the UFO within seconds of each other. The object made elliptical passes either near or around each of three sets of performing jets. It flew past the Halcones, F5s, and F16s at speeds so fast it was not noticed by the pilots or anyone on the ground below." She continued, "This extraordinary machine was flying at velocities too high to be man-made. Scientists have estimated the speed, depending on the size of the object, to be at least 4,000–6,000 mph." Kean should have realized that speed estimates are only valid if one knows for certain the distance from the "UFO" to the camera, which in this case we obviously don't.

Kean continued, "Images show it as

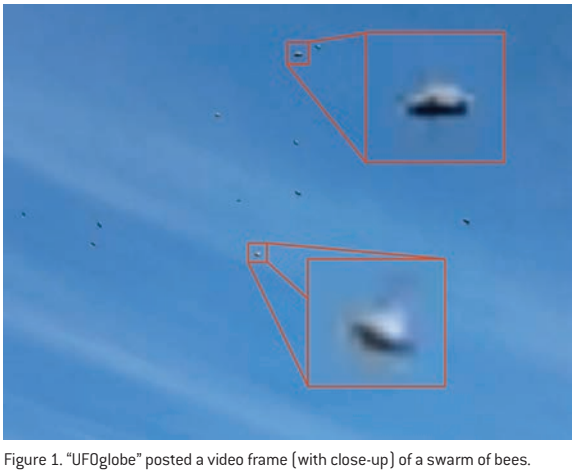


Figure 1. "UFOglobe" posted a video frame (with close-up) of a swarm of bees.

Figure 2. The Chilean "UFO" close-up from Leslie Kean's article.

a dome-shaped, flat-bottomed object with no visible means of propulsion. The rounded top reflects the sun and appears metallic; the bottom is darker and flat, emitting some form of energy which is visible in photo analysis. Infrared studies show the entire object is radiating heat, just like the jets." She did not explain how it would be possible to do an "infrared study" of the object captured by an ordinary video camera with no infrared capabilities; indeed she seemed to not even realize that this claim is absurd.

Almost immediately, I am happy to say, many people began critically examining this supposedly game-changing video and its analysis, even in places like the conspiracy-oriented Above Top Secret forum. Many noted the object's resemblance to an insect flying wildly close to the camera. Poster UFOglobe (http://tinyurl.com/7mx7muz) compared the close-up of the UFO in Kean's article with that of bees in a swarm (compare Figures 1 and 2). The resemblance is easily seen.

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A detailed discussion and analysis of the CEFAA video appears on the website of The Hoax Killer (http://tinyurl.com/7acu9x6), who did excellent work exposing the recent Jerusalem UFO video hoaxes. He downloaded the highest-resolution version of the video from the *Huffington Post* site. He writes, "After studying the videos very closely I discovered the objects are passing in front of the hills a couple times. I was also looking for other insects that might be flying around closer to the ground and found what I think is one that is visible for a moment." He posted a thirty-second video to YouTube, highlighting the UFO as it is seen not only flying in front of the distant hills but also *in front of the nearby ground.* Case closed: this UFO is a flying insect.

UFO skeptic Tim Printy notes, "What this demonstrates is that the original video that was posted was edited in a way so one could not see the UFOs with the ground in the background." In other words, somebody—presumably someone within the CEFAA—edited the video with the deliberate intent to deceive the audience. Otherwise, it would have been obvious that the UFO was a bug. Blogger Kentaro Mori noted how the CEFAA recently released another supposed UFO photo touted as the "best evidence" yet for a UFO, which turned out almost certainly to be a light reflection (http://tinyurl.com/7tqkymy). He also noted that the CEFAA was then, as now, unwilling to release any additional images or information regarding the supposed UFO. Clearly, any future UFO claims from Chile's CEFAA must be viewed with great suspicion.

As one might expect, this case was widely discussed on the Internet in the weeks afterward. Even many who are favorably inclined toward UFO claims dismissed the El Bosque video as a flying insect. But instead of giving up and admitting the obvious, on March 24 Leslie Kean doubled down on the case, writing on her Facebook page,

> Have patience folks. More info will be presented soon. You can't draw conclusions from looking at only one tape. And please remember, these images have been analyzed by experts in Chile. Didn't I emphasize that enough in my *Huffington Post* story? They too thought the footage was a bug at first, until they collected the other tapes. It is an insult for you to carry on about this being a bug, when obviously if you can figure that out so easily, the Chilean experts would have done the same. (http://www.facebook.com/lesliekean)

A strange metallic flying object?

Like I said, she *really* is trusting of so-called experts who make proclamations about UFOs. She seems to have forgotten that experts just like these, many with PhDs, also analyzed the Petit-Rechain UFO photo from Belgium and concluded that "the picture was not faked" (p. 30 of her book *UFOs: Generals, Pilots and Government Officials Go On the Record*). Yet it's now a confessed hoax (see this column, SI, January/February 2012). It seems that "experts" do not have a very good track record when it comes to authenticating a UFO photo or video.

But the story doesn't end there. You Tube user Stiverinmypocket analyzed a longer video of the same November 5, 2010, airshow on the Chilean website Aviacion Total, independent of the video of the CEFAA (http://tinyurl.com/c45npv6). It, too, is filled with fly-like UFOs buzzing in front of the airplanes. However, on this video the UFO moves in an opposite direction with respect to the jets than in the CEFAA video. Stiverinmypocket wrote, "My intention was to show that the object in the CEFAA video can NOT be a UFO, because the respective object in this old video travels in the opposite direction. It is probably another bug close to Olave's camera, who was shooting simultaneously from another vantage point." I'm sure that there are plenty of bugs to go around.

In a March 25, 2012, posting on his UFO-Blog.com, Michael Naisbitt noted that a March 2010 video of an air show at El Bosque, shot eight months before the now-famous one, shows similar fly-like UFOs zipping around (http://tinyurl.com/cgkjgda). So either UFOs infest the El Bosque airfield in Chile—or flies do. Perhaps the airfield's name should be changed to El Mosca—"The Fly."

Clearly stung by the criticism even from many in her own camp, Kean kept promising an update on her Facebook page but then kept delaying it. On the afternoon of April 13, exactly one month after her initial story, she finally posted to the *Huffington Post* her promised update on the Fly Saucer. Unlike Kean's initial story, there does not seem to be any link to it on the *Huffington Post* homepage. However, the update appears prominently on Kean's Facebook page. It almost seems that she did not want to bring any new readers into this controversy. Her new piece is titled "Update on Chilean UFO Videos: Getting the Bugs Out" (http://tinyurl.com/7qcg6k3). Surprisingly, this update changes almost nothing: we don't really learn anything that we didn't know before. She complains that "Skeptics caused quite a stir by taking it upon themselves to do their own 'analysis' of the video clips and then to declare, with bravado, that the object of concern was simply a bug." How dare we take it upon ourselves to question her? She proclaims that "[General] Bermúdez [of the CEFAA] isn't going to prematurely toss the videos out onto the Internet to be played with by unqualified people"—meaning us skeptics—and she exhorts us to wait patiently until the "experts" finish their analysis.

So either UFOs infest the El Bosque airfield in Chile—or flies do. Perhaps the airfield's name should be changed to El Mosca—"The Fly."

Michael Naisbitt replied with a blistering rejoinder to Kean on his UFO-blog.com (http://tinyurl.com/832lj23). He pointed out that Kean had originally written that the CEFAA "had commissioned scientists from many disciplines, aeronautical experts, and air force and army photogrametric technicians to subject the videos to intense scrutiny. They all came to the same conclusions." Now she was claiming that the analysis was ongoing: "now a mere four weeks later we are told that the earlier analysis wasn't really complete and if that is the case then what of the earlier conclusions, were they incomplete as well?" Naisbitt concludes that Kean and General Bermúdez of the CEFAA both "do a bang-up job of contradicting themselves."

At this point, Kean is clearly wishing for the whole matter to simply go away. Clearly we are waiting for Godot to finish his analysis, and until that happens, "we all have to wait for further information, and be respectful of that process"—even though it's already been shown that the "UFO" is a fly. You don't need a photometric scanner and a PhD to see that the "UFO" is sometimes between the camera and the nearby ground.

"Is this the case UFO skeptics have been dreading?" asked a hopeful Leslie Kean. As a skeptic, I don't dread any such thing. I would welcome *solid* evidence that something extraordinary is flying around openly in Earth's skies. But it's been said many times that extraordinary claims require extraordinary proof, and UFO proponents will have to present a far better video than a fly buzzing around to prove their case. Indeed, the very fact that a video of a fly doing loops is being cited by some of the world's top UFOlogists as among the best UFO images of all time reveals how utterly lightweight even the best UFO photos and videos are.

Steven Novella, MD, is assistant professor of neurology at Yale School of Medicine, the host of the *Skeptics' Guide to the Universe* podcast, author of the *NeuroLogica* blog, executive editor of the *Science-Based Medicine* blog, and president of the New England Skeptical Society.

The Non-Mysterious Mass Illness in Le Roy, New York

In early 2012 the story of fifteen sick children in the same high school in Le Roy, New York, hit the media, which labeled this rash of symptoms as a "mystery illness." Of course, doctors were described as "baffled" (Almasy and Spellman 2012). Over a short period of time the teens started to exhibit involuntary movements and vocalizations described as tics, similar to the symptoms of Tourette syndrome.

In response to the media attention, several groups and individuals came forward to publicly hypothesize about what might be causing this rash of symptoms. Antivaccinationists suspected that it was a vaccine—or environmental toxin, at least—that had caused the illness. Chiropractor Russell Caram speculated that

> The other possibility here are HPV vaccines, Gardasil and Cervarix. The timing becomes more easily explained—as most children "get their shots" (and boosters, such as DTaP and the flu shot) before enrolling in school in the fall. It also satisfies the girls-only attack (even though they're trying to convince boys to get the Gardasil shot also), as well as the age group. (Caram 2012)

Caram's hypothesis suffers from more than the fact that it is pure speculation. Half of the children affected by the illness did not even receive the Gardasil or Cervarix vaccines, nor is there any evidence to suggest that either vaccine can cause such neurological symptoms in the first place. (Similarly, no evidence supports the claim that Tourette syndrome can be caused by vaccines or toxins.) When Caram wrote the article, only girls showed signs of the illness, but later one boy also developed symptoms, which further suggests that the HPV vaccines are not to blame.

Those who have made it their mission to expose the risks of environmental toxins see in this case a possible environmental toxin. Apparently, some of the parents of the affected children called upon famous activist Erin Brockovich, who sent her team to investigate. She has speculated about "... whether students have been exposed to contaminants from the train derailment that occurred within a few miles of the school in December 1970. That derailment spilled cyanide crystals and leaked carbon tetrachloride" (Ciavarri 2012).

Of course, an environmental toxin such as carbon tetrachloride would not explain the timeline of the illness or its predilection for girls. Why would a forty-year-old spill suddenly have an adverse effect on people living in the general area? The results of a search for environmental toxins in the area have already turned up negative, and the students themselves have tested negative for toxic exposure. However, this poses the problem of proving a negative. Brockovich claims that the search has not been thorough enough, but such a claim can be made arbitrarily without limit. You can keep searching for toxins with lower and lower thresholds until you find something. Toxins are ubiquitous in the environment in background concentrations generally too low to worry about, but if you look hard enough you can find something—especially if it's something you want to find.

Rosario Trifiletti, MD, PhD, is an expert in a rare condition known as PANDAS (pediatric autoimmune neuropsychiatric disorder associated with streptococcal infection), and she has come forward to claim that *this* is what these children have (Swedo et al. 2012). I cannot get into a thorough evaluation of this complex condition, but suffice to say that Trifiletti, who claims to be personally treating some of its patients, is a major promoter of this diagnosis. There is a tendency to see what we know, and experts in a narrow illness often see their pet disease everywhere. The National Institute of Mental Health's (NIMH) definition of PANDAS does not seem to fit this case well. Age of onset for PANDAS is supposed to be between three and puberty, but the Le Roy children are between the ages of twelve and eighteen. There is no indication that PANDAS is a selective illness, affecting girls more than boys. Furthermore, PANDAS is a clinical diagnosis without laboratory confirmation; part of that clinical diagnosis is that symptoms are triggered by a streptococcal infection (such as strep throat), which does not appear to be the case here. PANDAS also involves more than tics—it can include mood changes and obsessive compulsive symptoms, too. Altogether, based on publicly available

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information, PANDAS does not seem a great fit for answering the question of this "mystery illness."

The "mystery illness" has become a Rorschach test of sorts: people see in the illness a diagnosis that fits their worldview or pet cause. But now that the dust has settled somewhat on this outbreak, what can we reliably say about it? To review the facts of the case, eventually fifteen children were affected with involuntary tics, which are sudden "jerk-like" motor movements, between October 2011 and January 2012. All fifteen of the children attend the same junior-senior high school and range in age from twelve to eighteen; all but one of them is female. All of the children have been examined by pediatric neurologists—twelve of the fifteen at the Dent Neurological Institute by the same two neurologists, including Laszlo Mechtler, MD.

Mechtler—and, in fact, all of the pediatric neurologists who have examined any of the children—has come to the diagnosis of conversion disorder and mass psychogenic illness. A conversion disorder occurs when psychological stress manifests as physical symptoms. We take this for granted to some degree; when people feel anxious they may get sweaty, nauseated, or short of breath and have palpitations. People who experience panic attacks can have these symptoms along with difficulty swallowing and episodes that may resemble certain types of seizures with feelings of being separate from reality or from themselves. These are physical symptoms resulting from purely emotional stress. But in some cases, psychological stress can also lead to neurological symptoms—pretty much any neurological symptoms, such as weakness, difficulty speaking, loss of vision, and involuntary movements.

It is important to note that this is a known and well-established syndrome (Stone et al. 2011). Neurologists see patients with conversion disorder frequently, and many cases positively demonstrate that the neurological symptoms are not due to any damage or lesion in the nervous system but rather to psychological stress. For example, it can be demonstrated in someone with psychogenic blindness that their visual system actually works. Similarly, many patients with psychogenic seizures display features that are neuro-anatomically incompatible with actual seizures.

It is always challenging to deal with conversion disorder. We medical professionals try very hard to accurately and constructively convey to patients and their families what is happening, but unfortunately our culture attaches an undeserved stigma to psychological ailments, and many patients resist such a diagnosis. We tend to focus on the positive—psychogenic symptoms can completely cure themselves (and usually do with encouragement and reassurance to the patient) because there is no irreversible damage to the nervous system.

The diagnosis of psychogenic illness, however, is also partly a diagnosis of exclusion. It is often the case that a physical ailment underlies the psychogenic symptoms and has, in fact, triggered them. The diagnosis, therefore, is usually made only after a thorough workup to rule out other causes.

In the case of the children in Le Roy, doctors report that they have thoroughly evaluated the children—including screening them for any toxins, infections, or signs of a physical illness—with completely negative results. The school has been examined also, and no environmental toxins or chemicals have been discovered.

Here we are probably dealing with not only a psychogenic illness but also a case of mass psychogenic illness, which is also a known phenomenon that can even be induced experimentally (Broderick et al. 2011). In cases of mass psychogenic illness, the appearance of symptoms in other people, which causes anxiety about a contagious illness or a toxic exposure, can be the stressful trigger. In susceptible individuals this can induce a psychogenic illness that mimics the symptoms of those already affected. Media coverage only enhances this phenomenon; in fact, some speculate that social media increased the spread of the Le Roy children's illness.

The Le Roy case has all the hallmarks of a mass psychogenic illness. Most of the symptomatic individuals are women who are part of the same small, close-knit community and have social contact with each other. The diagnosis is therefore not based entirely on the exclusion of other causes; the case also has a natural history and epidemiological features that fit a mass psychogenic illness. Although the available details of this case point to a mass psychogenic illness as the culprit, there may be one or two index cases of true Tourette syndrome that triggered the outbreak. It is an important lesson, as most people underestimate the ability of our brains to generate physical symptoms.

On the one hand, there are the neurological experts who have presented what seems to be a sound diagnosis. On the other, there is a circling of those who want to promote their causes or ideology. In the middle of all this are the students and their families who have to deal with a delicate neurological ailment before the public eye. We can certainly hope that science and reason win out, but often the most alluring and media-friendly answers come from the cranks who would manipulate the diagnoses of experts to weave a sinister tale.

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Besieging the Last Bastions of Race

There's no point in telling someone that being "black," for example, no longer matters in the twenty-first century. As history plainly demonstrates, being black will continue to matter profoundly so long as "blackness" exists. The more helpful and, as it turns out, honest approach might be to explain that "race"—like clairvoyance, transcendence, or holiness, for instance—is, in reality, all in our heads.

We have a knotty problem indeed whenever society accepts or even emphasizes what science deems a dangerous myth. In 1972, geneticist Richard Lewontin told us that more genetic diversity exists among West Africans than between West Africans and Europeans. We also know that disease polymorphisms are totally inconsistent with the nineteenth-century notion of taxonomic race and that blood types don't sort by geographic region.

Yet the notion of race endures. Why? And who should be targeted for blame? Don't waste all of your arrows on the easiest, most familiar targets—the uneducated or otherwise unworldly xenophobes who will likely never come within spitting distance of this publication or any remotely like it. Racism is far more inclusive these days, even if seldom referred to as such.

Personal case in point: My former fiancée and I recently applied for a marriage license in Wisconsin. Upon arrival, the county clerk asked each of us to designate our race. "None," we replied in turn, choosing our responses carefully. But the clerk nevertheless typed "refused" on our application, as she apparently had been instructed to do.

But the racist bug continues to spread deeper into well-meaning but wrong-headed bastions of polite society. Earlier this year, the University of Wisconsin–Madison—notably liberal and otherwise highly respected in scientific circles—was criticized for its admissions policies that intentionally discriminate against two races in favor of two others.

In 2010, the U.S. Census Bureau endeavored to segregate more than 300 million highly intermixed Americans into fourteen discrete racial categories. And even social scientists routinely employ self-identified race as a variable in international studies—despite the fact that the concept's meaning varies from country to country.

But, thankfully, we can depend on the "harder" sciences and their more rational practitioners to promote a relatively systematic and objective approach.

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Or can we?

In his introduction to *Race and the Genetic Revolution: Science, Myth, and Culture* (Columbia University Press, 2011), Sheldon Krimsky, Tufts University community health specialist and coeditor (along with human rights advocate Kathleen Sloan), confirms that race amounts to nothing more than a "scientific myth"—a "vestigial cultural artifact" persisting only in our "minds and public policies."

Race and the Genetic Revolution emerged from two projects launched by the Council for Responsible Genetics. The first examined the effects of expanded DNA databases on racial disparities in criminal justice. The second, more interesting to me, explored how modern scientific—especially medical—practices have actually revived a dangerous concept that should have been tagged and bagged years ago.

In a concise historical essay, contributor and Drexel University public health expert Michael Yudell considers the recent "upsurge" in race-based medicine and its possible drivers. The genetic revolution, he finds, combined with our noble desire to resolve certain health disparities—especially in heart disease, cancer, and diabetes, for example—has scientists rummaging for solutions in every possible direction.

Unfortunately, many well-intentioned researchers have reverted to race. According to Yudell, this reckless trend suggests that "an analysis of the complex relationship between individuals, populations, and health will be surrendered to a simplistic, racialized worldview."

Enter BiDil, a drug manufactured to treat heart failure. A small Massachusetts biotech company called Nitro Med brought BiDil to the FDA in 2001, expressly requesting race-specific

approval. Based on a trial in which every participant self-identified as "African American," the FDA acceded in 2005. The drug was subsequently labeled as indicated *only* for blacks.

In reality, however, BiDil is just a combination of two generic vasodilators—hydralazine and isosorbide dinitrate—that have been used without regard to race for more than a decade. Deeply troubled by the BiDil story for a number of reasons, contributor and Hamline University professor of law Jonathan Kahn indicts the FDA for opening a "Pandora's box of racial politics."

First, Kahn says, no scientific evidence has ever suggested that race has anything to do with how the drug works. BiDil was never evaluated on a control population of non-blacks, after all. Nor does common sense support the drug's designation: The FDA never approves and companies never market the numerous drugs tested only on white people as "white drugs." Second, had NitroMed requested and acquired only race-neutral approval, its patent would have expired in 2007 rather than 2020. Though scientifically inappropriate, in other words, the company's strategy was very impressive from a purely economic perspective.

Third, one wonders who counts as "African American"—or "black," as BiDil's label designates. Should we revert to Jim Crow era blood ratios to figure it out? Are Australian Aborigines or dark-skinned South Asians included? Fourth, race-based labeling might prevent non-blacks from obtaining beneficial or even life-saving medicine, and it might in effect render insurance companies the defining agents of race. Finally, Kahn stresses, by granting race-specific approval, the federal government fallaciously endorsed the use of race as a biological category.

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Kahn's argument, however, is not that race should never play any role in genetic research. "There may be occasions where race can be productively used," he instructs, but we must "differentiate between using a racial group to characterize a gene versus using a gene to characterize a race." It is entirely acceptable, for example, to study the Pima Indians of the American Southwest to characterize the genetic basis for diabetes. But scientists should never employ genetics to brand the Pima as a people burdened with the gene or genes for diabetes.

The proponents of "racialized medicine" thus allege the reliable predictability of a person's disease predisposition through determination of his or her biological race. Critics, on the other hand, emphasize the lack of any solid and consistent bases for biological race; even if such foundations existed, they say, we could never be certain that members of one race would share specific disease-related genes distinct from those of other races.

Contrastingly, advocates of evolutionary medicine claim that diseases result from combinations of infection, genes, novel environments, design compromises, and evolutionary legacies. Affecting all humans, the first and the latter two tend not to cause health disparities.

In the United States, these discussions focus on maladies like cancer, stroke, heart disease, and diabetes—all of which are influenced by several genes along with copious environmental factors. Thus, to address health disparities, according to Joseph Graves Jr., contributor and biologist at North Carolina A&T University, "we really must utilize the full intellectual arsenal of evolutionary genetics."

The evolutionary theory of aging informs us that genes causing certain diseases in old age can be either neutral or beneficial early on in life (mutation accumulation or antagonistic pleiotropy, respectively). Stomach cancer represents one such evolutionary legacy in mammals generally. In the United States, however, the disease tends to afflict East Asians at a higher rate than others. But contrary to common medical opinion, according to Graves, the primary explanation for this disparity is obviously not genetic. Rather, infection, frequent tobacco use, high salt intake, and low fruit and vegetable consumption are more culpable.

The National Institutes of Health spends $2.7 billion on health disparity research every year. But much of the resulting literature presumes genetic predisposition—a false paradigm and a "fool's errand," Graves concludes, that will persist until both the government and the science it supports choose to abandon the bizarre and highly toxic concept of race.

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Diving HeadOn into Pseudoscience

Q: I've seen an extensively advertised product called HeadOn, which claims to cure headaches by the application of an ointment to the skin of the forehead. Is there any truth to this?

—L. Herring

A: "Apply directly to the forehead," infamously commanded a TV commercial for HeadOn, a pain reliever introduced in 2006 by a company called Miralus Healthcare. The product, sold in drug stores and online for $25, claims to relieve headache and migraine pain. It is neither a pill nor a solution but instead a waxy paste. Topical medicines are sometimes used to relieve local skin and muscle pains, but the idea that they could somehow relieve headache pain has aroused plenty of skepticism.

The first clue that something's amiss with this product is its homeopathic formula. Homeopathic solutions are often so literally watered-down that they don't contain a single molecule of the original medicine or substance: essentially the patient is drinking or using nothing but water. Homeopathic medicines have not been shown to work better than placebos, yet many people use and endorse homeopathy.

In 2006, skeptic James Pryor contacted the makers of HeadOn, requesting information about how the product could possibly work, since HeadOn "does not penetrate the skull. So it must enter the blood stream. The only way for it to get to my brain is for it to travel to the heart through the bloodstream, then back out through the bloodstream to my brain. So how is it better than a swallowed pill that breaks down, enters the bloodstream, and travels to my brain?" On the James Randi Educational Foundation website, Pryor posted the official company response, which was as concise and evasive as it was medically ignorant: "It works through the nerves."

Consumer Reports noted that no clinical trial data proving that the product works had been made available and that "A company executive said such studies had been conducted but were not yet published and therefore could not be divulged. Without those data, our medical consultants said, any apparent efficacy may be the result of the placebo effect." In March 2006 the Better Business Bureau (BBB) recommended that HeadOn discontinue making unproven claims about its product's efficacy; six years later the company has yet to do so, perhaps as a result of the BBB's lack of enforcement power. *Consumer Reports* concluded, "Given the lack of clinical evidence showing that HeadOn works, it makes more sense to try proven drug treatments" (see www.consumerreports.org/health/prescription-drugs/headon-9-07/overview/0709_headache_ov_1.htm).

Though the kitschy HeadOn commercials are not as common as they used to be, the product is still around. On its Amazon.com page, there are twice as many five-star reviews touting the miracle product's amazing relief as one-star reviews dismissing it. The placebo effect is powerful indeed. ■

‘Mystery Illness’ in Western New York

Is Social Networking Spreading Mass Hysteria?

The recent outbreak of twitching, facial tics, and garbled speech—symptoms of a form of conversion disorder—at a school in Western New York may signal a growing trend in the United States. During the twentieth century similar outbreaks were recorded in only four schools, yet in the past decade alone this form of psychogenic illness has already appeared in three U.S. schools. We may be witnessing a milestone in the history of psychogenic illness, where the new vectors are the Internet and social media.

ROBERT E. BARTHOLOMEW

Of all our passions, fear weakens judgment most. —Bertrand Russell

A thirteen-year-old schoolgirl exhibits facial tics, trembling, twitching, and difficulty communicating. Classmates soon develop similar symptoms. This outbreak, reported in Basel, Switzerland, in 1904, parallels the one that students at Le Roy Central School in Western New York experienced in 2011–2012. In all, twenty-seven students were affected in the Swiss episode (Zollinger 1906); twelve years earlier in 1892, similar symptoms swept through the same school, affecting twenty pupils. Often the twitching would subside at home only to flare up upon a student’s return to the school grounds (Aemmer 1893). In a similar vein, Dave Watson, a parent of one of the affected Le Roy students, observes: “How can you send your child to school perfectly normal and a couple of hours later you’re picking her up in this condition?” (Nelson 2012).

The symptoms exhibited by the students in Le Roy and Basel are nothing new; in fact, they recall a similar rash of symptoms that affected a group of girls in 1692 in Salem, Massachusetts Bay Colony. It is the same disorder in a different cultural guise. What is new is the way these outbreaks appear to be spreading. Traditionally, they have affected close-knit students in the same classes or classroom, but in the three recent outbreaks in the United States, the pattern of spread was more dispersed throughout the school. This new trend conspicuously coincides with the rise of the Internet and social networking sites as such Facebook, YouTube, and Twitter.

Historical Perspective

When individuals or groups of people come under significant stress for long periods of time, they may develop strange behaviors and symptoms as a result of the stress. After eliminating organic and environmental causes of the behaviors, scientists and health professionals focus on the social patterning of these episodes and the role that pent-up stress can play in their development; such stress-induced episodes are diagnosed as conversion disorder. In cases where multiple individuals are affected, the diagnosis may be mass psychogenic illness. Stress disrupts the nerves and neurons that send messages to the muscles and brain. As a result, the body of a stressed individual may undergo temporary bouts of twitching, spasms, and shaking. Sometimes affected individuals exhibit trance-like states and amnesia.

While the onset of symptoms may be gradual, it usually takes weeks or months for the anxiety to subside, the nerves to settle down and function normally again, and the symptoms to disappear (Bartholomew and Wessely 2002). In some individual cases of conversion disorder, the patient disputes the diagnosis; in the case of a student, for example, where neither parents nor the public will accept a psychological cause for the symptoms, the symptoms can spread to other students and endure for years. One outbreak affecting thirty-six students at an Islamic school in Alor Star, Malaysia, during the mid-1980s endured five years in a waxing, waning fashion. The episode, which included twitching, shaking, and “spirit possession,” only subsided permanently after the former prime minister intervened and had the affected girls transferred to a more liberal school (Bartholomew 2000).

Such outbreaks most commonly occur in schools and factories where close-knit groups exist in restricted, stressful environments that are not easy to escape. Though factory workers can quit their jobs and students can walk out of school, doing so comes at a high price. Between the nineteenth and early twentieth centuries, outbreaks of twitching, shaking, convulsions, fainting spells, and trance states were common in European schools, especially in France, Germany, Switzerland, and Austria. At Gross-tinz, Germany, between June and October 1892, hand tremors, trance states, and amnesia struck twenty

students (Hirt 1893), while arm and hand tremors forced a school in Chemnitz, Germany, to cancel its writing classes in 1906 (Schoedel 1906). The schools involved were always those with high performance standards that placed significant amounts of pressure on the affected students over an extended period of time. The German cases seem to have been triggered by the implementation of tedious, monotonous writing classes.

Two Types of Conversion Disorder

British psychiatrist Simon Wessely (1987) has identified two main types of collective conversion disorder, or mass psychogenic illness. The most prevalent type in Western countries is triggered by the sudden exposure to a stressful agent, most often a foul odor that is believed to be toxic. Symptoms typically include fainting, dizziness, headaches, and hyperventilation, with most episodes lasting less than twenty-four hours and victims recovering rapidly with encouragement and support. In cases where a harmful agent is believed to remain on the school grounds, relapses may occur. Outbreaks of this type became common beginning in the mid-twentieth century, coinciding with the rise of the environmental movement and concern over the contamination of food, air, and water.

A second rarer form of conversion disorder is triggered by long-term stress that disrupts the nerves and neurons that send messages to the muscles and brain. Sometimes referred to as motor hysteria, this second type of conversion disorder features outbreaks of twitching, shaking, difficulty in walking and speaking, seizures, and trance states, all of which appear slowly over a period of weeks or months. Many cases take weeks or months to subside, too—and only after the stress has been reduced or eliminated.

Outbreaks of mass psychogenic illness affecting motor function are common, and dozens of cases are reported each year. Most of these cases are confined to Africa and Asia, where symptoms often involve collective spirit possession triggered by a belief in witches, demons, and ghosts; twitching and the blurting out of unintelligible words or phrases are also common (Bartholomew and Sirois 1996). These cases are rare events in Western countries, yet many of the few recent cases evidence anxiety generated by interpersonal conflict.

In 1939, a twitching epidemic broke out among a group of girls at a high school in Bellevue, Louisiana. The first girl, a poor dancer who feared her boyfriend would leave her, began to twitch and was recused from dance classes. Investigators theorized that the symptoms spread to six other girls over the next several weeks because of the attention that was given to the first victim, including increased affection from her boyfriend (Schuler and Parenton 1943).

In 1962, a series of blackout spells affected an African American school in Louisiana where a significant number of students were sexually active. The symptoms started after rumors that authorities were going to administer pregnancy tests, with offenders to be transferred to reform school, began to circulate among the students (Knight et al. 1965). The rumors were unfounded, but in cases of mass psychogenic illness perception is everything.

When several girls in Mount Pleasant, Mississippi, began to act strangely in April 1976, school officials suspected drug use, and narcotics agents swarmed the building after fifteen students fell to the ground "writhing and kicking before passing out" ("Fainting Spells" 1976). Police found the girls were drug-free and concluded that hysteria was the culprit. Many students and parents blamed voodoo. The girls would suddenly fall to the floor, kicking and screaming, "Don't let it get me!" or "Get it off!" before passing out. Attacks lasted up to fifteen minutes. The trigger was identified as a schoolgirl rivalry over the affections of a boy. One group of girls said that a jealous classmate had put a voodoo hex on them. The fear of magic spells spread quickly through the group after the first few girls suffered fits, which only confirmed their classmates' suspicions of sorcery and fueled their own fears that they would be next.

Le Roy Junior/Senior High School senior Thera Sanchez speaks on the *Today* show in New York. Sanchez said she was fine until she woke up one day and began stuttering. She said symptoms worsened to the point she couldn't even attend class. She said she's had some psychological counseling, which she says increased her stress but has not resolved whatever is causing her condition. "I want an answer. A straight answer," she said on the show. (AP Photo/NBC News/TODAY)

Twenty-First Century Outbreaks—a New Trend

In 2002, a mysterious malady swept through a high school in rural North Carolina. Ten girls developed seizures at the start of the new school year along with fainting, headaches, lightheadedness, muscle twitching and jerking, tingling, and numbness. The school nurse noted that the fits were unlike any epileptic seizures that she had ever seen. When she placed smelling salts near the noses of a couple of the girls, they cringed, while the mothers of two girls said that when their daughters began to have fits they "could 'talk her out of it' as the episode started to develop" (Roach and Langley 2004, 1270). There was another oddity: the malady rarely occurred in class but struck students in the hallway between classes, in the cafeteria, or in the schoolyard during recess.

The first stricken was a cheerleader, and the fear of "catching" her seizure may have made her fellow cheerleaders and other classmates nervous, triggering their blackout spells. It may have also been some kind of identification with a school role model, as four others who were affected were either cheerleaders or former cheerleaders. This case is unusual in the scientific literature, for three of the students were eleventh-graders, three were tenth-graders, and four were in the ninth grade. Historically, outbreaks of psychogenic illness in schools occur among students who share classrooms, but in this case just two were in the same class. It took four months for the symptoms to subside. Neurological exams confirmed that the seizures were psychogenic.

In 2007, an epidemic of twitching limbs, headaches, and dizziness were reported at William Byrd High School in Virginia (Harrison 2007). At least nine girls and one female teacher were affected. Media reports indicate that the students did not all share a common denominator, such as being from the same classroom. The outbreak occurred amid a spate of public health concerns for the Roanoke County Public Schools, including an asbestos scare, warnings about a drug-resistant Staphylococcus (Golden Staph) infection that was blamed for the death of an area resident, and concern over the recent mass shooting at Virginia Tech. After conducting a battery of tests, the Virginia State Health Department officially listed the cause as psychogenic.

Le Roy Junior/Senior High School, the location of the recent outbreak of mass psychogenic illness.

Fear 101—the Le Roy Affair

In 2012, another outbreak of motor conversion disorder was reported among students at Le Roy Central School in Western New York. By early February the total number of affected students had reached fifteen, including one boy. What makes the case unusual is that based on media reports, the symptoms were not confined to one class or group but were scattered throughout the school. The media first brought attention to the "mystery illness" in 2011. Naturally parents and community members were concerned because the symptoms were dramatic: facial tics, twitching muscles, and unintelligible verbal outbursts that resembled Tourette syndrome. Some of the girls could not complete a single sentence without severely garbling her words.

Given that Le Roy was the site of a chemical spill resulting from a train derailment in 1970, exposure to toxins became an immediate theory behind the cause of the outbreak. Fox News medical consultant Marc Siegel, MD, said he was almost certain the symptoms were the result of PANDAS, an illness caused by strep infections (see www.youtube.com/watch?v=eOSJs3aOT1E&feature=related). Other causes were posited: Lyme disease, pesticides, electromagnetic fields, government experiments, and magnesium deficiency. There seemed no end to the list of possible causes.

The New York State Health Department tried to allay the public's fears by announcing in early January 2012 that they had eliminated environmental and organic causes. They even claimed to have identified the cause of the outbreak but said

they could not disclose it publicly due to medical privacy laws. Their cryptic announcement only served to generate further anxiety among the public.

In early January 2012, a Buffalo-area neurologist, Laszlo Mechtler, MD, who was treating many of the girls, revealed the Health Department's diagnosis: conversion disorder, formerly termed "mass hysteria." An outcry arose among the girls' parents who did not want to accept a psychological cause behind the girls' physical symptoms. Presumably, their parents' outcry created more stress for the affected students.

The New York State Health Department contributed to the fear surrounding the illness by withholding the diagnosis, generating undue alarm and public suspicion. The Department's position that privacy issues prevented their release of the diagnosis generated so much public anxiety that it transformed the case into a public health issue in which the rights of the public to know outweighed the privacy rights of a small group of individuals. But it is clear that the Health Department was correct in its diagnosis: not many diseases or toxic agents almost exclusively affect young girls. If exposure to toxins in the area near the school caused the symptoms, as many locals and other professionals suggested, why were teachers and maintenance staff who had been present at the school for decades or parents not affected? The way in which the cases spread from one student to another, combined with the elimination of environmental and organic causes, points to conversion disorder as the logical diagnosis.

Mass Hysteria and the Social Network

The Le Roy case is significant in that it is the first vigorously disputed case of conversion disorder to occur in the United States during this social networking era. People can view the girls on YouTube, follow the latest events on Twitter, and exchange Facebook links related to the case. The case is likely to endure, not just because of the toxic dumpsites located in Western New York but also because the involvement of high-profile people like Erin Brockovich has brought even more media attention to the situation. There's another reason behind the persistence of this case: we may be witnessing a shift in the history of psychogenic illness in which the primary agents of spread are the Internet, media, and social networking sites.

Australian expert on conversion disorder Paul Cropper believes that mass psychogenic illness can act as a force for instant social networking. He observes that the Le Roy girls may not have known each other well, but they "may have unknowingly shared the fact that they felt 'invisible,' excluded, neglected (if only in a minor way), stressed, etc., but once Case 1 arrives it becomes a public invitation for all the others to join this exclusive club or protest—'the tic sufferers.'" Cropper believes that the attention the case has drawn to the girls subconsciously underscores their status as special, different, and suddenly "visible" (Cropper 2012).

Clearly the Health Department's failure to render its diagnosis public has eroded its credibility and fuelled the public's suspicion, ensuring that this issue will continue to consume public and private resources and generate needless anxiety. With disgruntled parents contacting the likes of Erin Brockovich, who is now searching toxic dump sites for the "real" cause behind the outbreak, this episode will haunt the New York State Health Department for years to come. Scientists will publish journal articles about it. Residents will write books on it. Allow me to suggest a title: *The "Mystery Illness" in Western New York: How Not to Handle a Case of Mass Psychogenic Illness.*

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Neurologic Illness or Hysteria?
A Mysterious Twitching Outbreak

JOE NICKELL

It began in 2011, a "mysterious illness" among teenage girls at the high school in Le Roy, New York (Figure 1) (Asztalos 2011). Six cases were reported, then twelve, then fifteen and counting as the story captured attention across the United States and beyond ("Doctors baffled" 2012). The story's development included significant coverage on NBC's *Today* show and CNN's *Dr. Drew's Lifechangers*. I twice visited Le Roy (just fifty miles from my office) on behalf of the SKEPTICAL INQUIRER, to talk with parents and others involved, visit relevant sites, and otherwise investigate this strange outbreak.

Failed Theories

Beginning with at least one case as early as May 2011 and increasing to twelve by early January 2012, the phenomenon originally struck only teenage girls, who exhibited the symptoms of a strange Tourette-like condition with tics (involuntary twitches) and uncontrolled verbal outbursts.

Tourette syndrome is an inherited neurological disorder, and it is not caused by environmental conditions. It is some three to four times more likely to affect boys than girls and tends to occur sporadically in a given population, so the odds against a dozen girls at one location suddenly developing Tourette syndrome are astronomical (Mink 2012; Tan 2012a). Indeed it was not that disorder that assailed the Le Roy teens.

Figure 1. Le Roy Junior/Senior High School in Western New York is the site of a "mysterious illness." (Photos by Joe Nickell)

But if not Tourette syndrome, then what could it be? Health professionals considered a variety of possibilities:

Autoimmune disorder. A Health Department report pointed to a lack of evidence for one touted theory, an autoimmune disorder known as pediatric autoimmune neuropsychiatric disorders associated with streptococcal infections (PANDAS). While four of the six girls tested did have elevated levels of a strep antibody, the levels were not high enough to involve PANDAS. Besides, for a diagnosis of PANDAS to be made five criteria must be met, and not one of the Le Roy cases met all criteria (New York 2012; Orr 2012). Moreover, PANDAS occurs three times more often in boys than in girls (Swedo 2012).

Vaccines. Some persons suggested vaccines—especially the Gardasil human papillomavirus vaccine, which is given to young females to prevent cervical cancer and is now also approved for use by males—as a potential cause of the outbreak. However, according to a New York State Department of Health report, while seven of the twelve girls had received one or more injections of that vaccine, they were at different stages in the vaccination process; for six of the seven the onset of their symptoms came over a year after their last injection. Moreover, the scientific literature does not show any links between the Gardasil vaccine and tic disorders (New York 2012; Orr 2012).

Drugs. That the symptoms might be caused by something the students ingested—including stimulants, prescription drugs, or other substances—was discounted as unlikely by Jonathan Mink, chief of child neurology at the University of Rochester Medical Center. (Mink is also cochair of the Tourette Syndrome Association's scientific advisory board.) Mink noted that it would take a significant dosage of a drug—whether prescribed or not—to cause tics, whereupon other behavior changes would become apparent (Mink 2012). The Health Department noted that toxicology screens for five of seven of the students were negative, while two were posi-

Environmental causes. Some environmentalists, such as high-profile activist Erin Brockovich, have suggested that toxic substances may be responsible for the girls' symptoms. In particular they have referred to a site some three-and-a-half miles away (outside the nearby village of Lime Rock) where, on December 6, 1970, a train derailment resulted in the spill of one ton of cyanide crystals (which were promptly removed) and 30,000 gallons of trichloroethene (TCE), which still contaminates the site (Environmental Protection Agency 1999) (Figure 2). Brockovich (2012) referred to reports of "an orange-yellow substance oozing up from the ground" in a Le Roy school field. I talked with one afflicted girl's father, Jim DuPont (2012), who also called attention to the possibility of incomplete combustion of natural gas from four wells drilled on school property.

I spent more of my time on environmental concerns than on any other theory—speaking with parents, an environmental activist visiting from Toronto (Tarr 2012), an environmental tester (Rumrill 2012), and beleaguered school superintendent Kim Cox (2012a); twice visiting the toxic-spill site, where I met investigating U.S. Representative Kathy Hochul; and more. Ms. Cox exhibited grace under fire, especially at a raucous community meeting (Figure 3). She has worked for months with numerous medical professionals and other relevant agencies (the state's Department of Health and Environmental Conservation and the U.S. Environmental Protection Agency). Professionals from these agencies provided assurance that the school is safe, and an independent firm is conducting ongoing research. So far, tests of air quality and drinking water confirm that conclusion (New York 2012; Holvey 2012; Cox 2012b; Tan 2012c). The alarming "orange ooze" was simply rust fungi, which is common to the Kentucky bluegrass sod used for the field. The Health Department's report (New York 2012) concluded that "the occurrence of symptoms in only female students and the range of time of symptom onset are not consistent with an environmental cause." Kim Cox (2012a) stressed that point to me, stating that environmental causes would not discriminate between girls and boys, that a wide range of people—younger students, more boys, teachers, staff—would also have been affected.

Conversion Disorder

In time, neurologists diagnosed the students with *conversion disorder*, "a group of symptoms suggestive of organic disease but without an identified cause in a group of individuals with shared beliefs about the cause of symptoms." Conversion disorder is, therefore, a psychological condition whose cause is, typically, "significant life stressors," the brain "converting" severe mental stress into actual physical symptoms, such as blindness, paralysis, numbness, fainting, and mutism. While conversion disorder (formerly called "hysteria") is the diagnosis for an individual, the group diagnosis is *mass psychogenic illness* (popularly called "mass hysteria") (New York 2012, 7; Goldenson 1970, 260–63). Much additional evidence in the Le Roy outbreak appeared to confirm both individual and group diagnoses.

Of the twelve girls, three had previous medical illnesses associated with tics—one of them "a pre-existing Tourette's diagnosis" (New York 2012, 4, 6). One of these could have served as an "index" case that produced subconscious mimicry in the other girls. Of the remaining eight (one girl did not seek medical attention), each was discovered to have had a major stress in her life—such as parents divorcing—according to a pediatric neurologist in nearby Batavia, Jennifer McVige, who has seen ten of the girls (Stobbe 2012). Not only had some of the teens' own physicians diagnosed them with conversion disorder, but McVige and colleague Laszlo Mechtler, MD, also confirmed the diagnosis (Tan 2012b). Neurologists are able to distinguish between movements caused by neurological conditions and those due to conversion disorder. For example, one girl was observed in a video to have a flailing right arm that she was able to later use to carefully apply eyeliner (Tan 2012d).

Some of the parents, however, refused to accept the conversion disorder and mass psychogenic illness diagnoses. Jim DuPont (2012) told me that he instead suspected "a combination of things"—such as some students' predisposition toward illness, as well as anything that could impair the immune system and, of course, any of the various environmental causes—was to blame. Another parent, Beth

Figure 2. U.S. Representative Kathy Hochul investigates the site, about 3.5 miles from Le Roy school, where a 1970 train derailment caused a serious toxic spill.

Figure 3. Panel of school officials and environmental experts hears criticisms at an often heated community meeting held at the school, February 4, 2012.

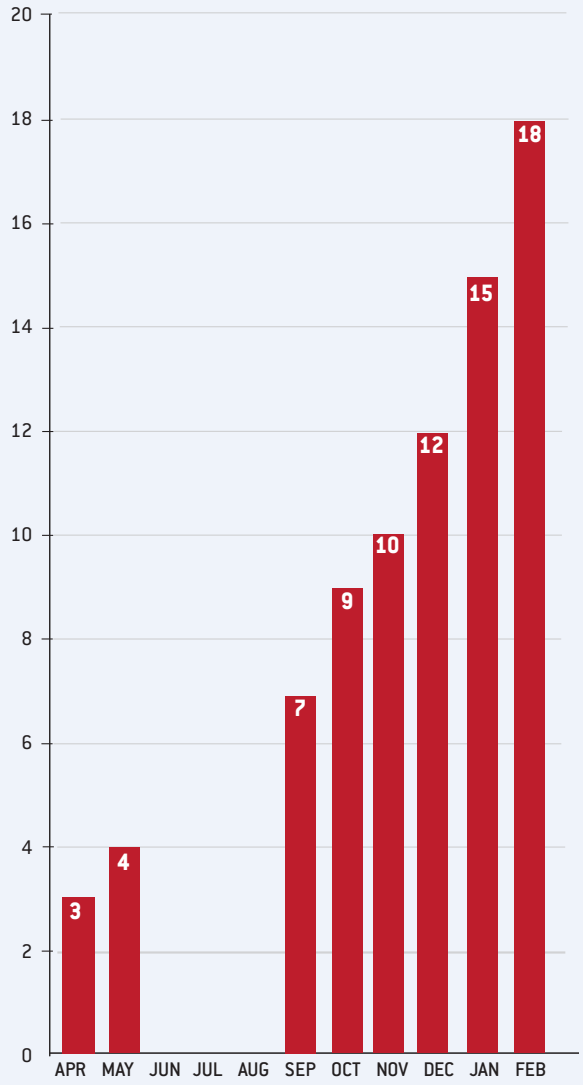

Figure 4. Le Roy Outbreak, 2011–2012. The original three cases had pre-existing conditions; school was out during the summer; then cases resumed at an accelerating rate.

Miller (2012), told me that she suspected a toxin or other cause, possibly a strep virus. She said the authorities have not looked at other children who report migraines and stomach conditions. (To play Devil's advocate, I suggested to her that probably some students at any school anywhere would exhibit some such common symptoms.) David G. Lichter, MD, a clinical professor of neurology at the University at Buffalo, observes that it is not uncommon for parents in such a situation to refuse to accept a psychological cause and to "doctor shop" for another diagnosis, which delays proper treatment (Tan 2012a). As for others, Mechtler notes that some will not accept such a psychological diagnosis because "they live a conspiracy life in a bioterrorist world" (qtd. in Tan 2012b).

Yet cases of conversion disorder and mass psychogenic illness are well known: in 2002, ten teenage girls at a rural North Carolina high school exhibited epileptic-like seizures and fainting spells. In 2007 some 600 girls at a Catholic boarding school in Chalco, Mexico, suffered fever and nausea and, in some instances, an inability to walk. Later in 2007, at least eight girls at a high school in Roanoke, Virginia, exhibited twitching symptoms like those that afflicted the girls in Le Roy. In none of these outbreaks was a physical cause found. Mark Hallett, MD, who helps field calls for the National Institutes of Health (NIH), states that the NIH averages two individual reports of conversion disorder per week. But while those cases are common, actual outbreaks involving several people are unusual. And why these outbreaks typically involve females is unclear. Some believe it is because of the manner in which girls are socialized to deal with stressful situations (Stobbe 2012). Those susceptible to conversion disorder tend to be "highly smart, vulnerable to suggestion, and very sensitive," according to a child and adolescent psychiatrist (Tan 2012d).

Meanwhile the Le Roy numbers had increased. By February 2, as many as fifteen cases were reported, including one boy and a thirty-six-year-old licensed practical nurse and mother, Marge Fitzsimmons, whom I met at a community meeting at the school. She accepts her doctor's diagnosis of conversion disorder (Schenek 2012). By February 4 the number had increased to eighteen students—still only one boy among them (Tan 2012c). (See Figure 4.) Added to this were reports of two girls with similar symptoms in Corinth, New York, some 250 miles away. Interestingly, the Corinth girls are members of a softball team that had stopped in Le Roy during a road trip in July 2011, though this was after one girl's symptoms had appeared (Roman 2012). While two Le Roy students had reportedly

(Roman 2012). While two Le Roy students had reportedly recovered after treatment, a few others regressed somewhat following the publicity and controversy (Mrozek 2012).

Although cases like those at Le Roy sometimes provoke allegations of fakery (indeed one restaurant employee there told me she thought the girls were just looking for attention), most experts think otherwise. Using the analogy of stage fright—which can produce shortness of breath, nausea, and other physical symptoms—experts believe the patients have actual symptoms that they cannot consciously control (Tan 2012a; Stobbe 2012).

Corroborative Evidence

A preponderance of the evidence tends to corroborate the diagnosis of conversion disorder/mass psychogenic illness in the Le Roy outbreak: (1) Medical examinations of the students failed to show any organic disease; (2) expert scientific investigations of the school and its environs failed to disclose any credible infectious or environmental sources for the cases; (3) the sufferers are mostly females, and conversion disorder is more prevalent among females than males; (4) the diagnoses were made by physicians, including neurological specialists, who actually examined the patients; (5) neurologists noted the difference between patients' imitative movements and those caused by an actual neurological condition; (6) three students had pre-existing illnesses associated with tics (one with a Tourette syndrome diagnosis), which could have sparked cascading cases of subconscious mimicry; (7) a bandwagon effect may be evidenced by the increased number of cases, the off-site case of an adult female, and the cases of two teenage girls in distant Corinth, New York; (8) students who accepted the diagnosis and treatment began to improve; (9) two students treated for conversion disorder were considered recovered; (10) overall, the Le Roy outbreak fits the profile of other cases of mass psychogenic illness that have been investigated elsewhere; and (11) the diagnosis has been supported by numerous knowledgeable medical and psychological professionals who reviewed the evidence.

Such an outbreak eventually runs its course. Lichter points out that suffering from a psychogenic illness does not mean that one is mentally deficient or otherwise unhealthy (Tan 2012a). It is important to understand that although the teens' symptoms may have a psychological origin, they are nonetheless real and painful. According to psychologist Gail Saltz (2012), the sufferers "need a psychiatric or psychological treatment. Treatment does work." And the neurologist Mechtler assured, "The bottom line is these teenagers will get better" (Jaslow 2012). ■

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The Social and Symbolic Power of AIDS Denialism

AIDS denialism has proved socially resilient because dissident "hero scientists" provide legitimacy, "cultropreneurs" offer fake cures in the place of antiretroviral treatment, and HIV-positive "living icons" seem to provide proof of concept.

NICOLI NATTRASS

The discovery of antiretroviral therapy (ART) transformed HIV infection from a death sentence into a manageable chronic disease.[1] Yet a small group of "AIDS denialists" rejects the science underlying ART, believing it rests on rotten foundations and that the therapy is toxic. These ideas have had deadly consequences. Most infamously, South African president Mbeki set up a panel of AIDS denialists and HIV scientists to debate the issue while delaying the use of ART in the public sector. Over 330,000 South Africans died unnecessarily as a result.[2]

In an earlier article[3] for the SKEPTICAL INQUIRER I described the different varieties of AIDS denialism, highlighting the views of Berkeley virologist Peter Duesberg, who believes—despite never having done any clinical research on HIV—that it is a harmless "passenger virus" and that AIDS is caused by recreational drugs, malnutrition, and even antiretroviral therapy itself. He and the other AIDS denialists on Mbeki's panel recommended that HIV testing be halted and that immune deficiency be treated through "massage therapy, music therapy, yoga, spiritual care, homeopathy, Indian Ayurvedic medicine, light therapy and many other methods."[4]

This article draws on my recent work revisiting the problem of AIDS denialism, this time focusing on its organized character.[5] I argue that the symbiotic connection between AIDS denialism and alternative healing modalities is facilitated by a shared conspiratorial stance toward HIV science, which has had powerful community-building effects. AIDS denialism gains social traction through four symbolically and organizationally important roles: the "hero scientists" (notably Duesberg) who provide a patina of scientific legitimacy for the movement; the "cultropreneurs" who offer fake cures in the place of ART; the HIV-positive "living icons" who seem to provide proof of concept by appearing to live healthily without ART; and the "praise singers," sympathetic journalists and filmmakers who publicize the movement.

Figure 1 shows the organizational connections between the key AIDS denialists. Duesberg is particularly influential. He sits on the boards of Rethinking AIDS (an organization that promotes his views about HIV) and Alive and Well (founded by HIV-positive "living icon" Christine Maggiore to promote alternative therapies). He also served on Mbeki's Panel and received extensive coverage in *House of Numbers*, a recent "documentary" funded in part by Rethinking AIDS.

Duesberg does more than merely question or rethink HIV science: he actively publicizes his unfounded claims. Mark Wainberg, a microbiologist and past president of the International AIDS Society, called him "probably the closest thing we have in this world to a scientific psychopath."[6] Duesberg's supporters, however, interpret such criticism as evidence of his unfair oppression by a corrupt "AIDS establishment." According to Celia Farber, Duesberg's leading praise-singer, "As AIDS grew in the 1980s into a global, multibillion-dollar juggernaut of diagnostics, drugs, and activist organizations, whose sole target in the fight against AIDS was HIV, condemning Duesberg became part of the moral crusade."[7]

David Rasnick, who writes with Duesberg, is also a hero scientist of sorts. He assisted the Rath Health Foundation with its illegal South African trial (which resulted in several unnecessary deaths) in which AIDS patients were taken off antiretroviral therapy and put onto high-dose vitamin products instead. The Alive and Well website claims he is the creator of protease inhibitors, but his name does not appear on any of the relevant patents. More important is Kary Mullis, an eccentric chemist who won the Nobel Prize for inventing the polymerase chain reaction. Mullis, who openly discusses his experimentation with hallucinatory drugs and alleged encounters

with extraterrestrials, has never worked on HIV; however, precisely because he won a Nobel Prize, he is a symbolically important hero scientist.

Robert Leppo, a venture capitalist who sits on the board of Rethinking AIDS, funds Duesberg's laboratory as well as Rethinking AIDS. Farber describes Leppo as the "reluctant hero of the underground" who "saved Duesberg from utter dissolution" after his federal funding was supposedly cut off "as punishment for advancing a scientific hypothesis that differed from that of the establishment."[8] Leppo was also the executive producer of an AIDS denialist film, *The Other Side of AIDS*, the promotional material of which describes him as "deeply involved in researching new medical protocols and alternative therapies, many of which are AIDS related."

The link between AIDS denialism and alternative medicine is embodied by what I term "cultropreneurs." Cultropreneurs use AIDS denialism and related conspiracy theories to undermine the credibility of antiretroviral therapy—a convenient marketing device for their alternative therapies. For example, the Rath Health Foundation describes antiretroviral therapy as a form of genocide inflicted on society by the "pharmaceutical drug cartel."[9] Gary Null, who sells a variety of books and alternative healing products, makes similar conspiratorial suggestions and often features AIDS denialists on his radio show.

A common notion promoted by cultropreneurs is that AIDS symptoms are caused by stress and harmful mental states. For example, Michael Ellner, the president of HEAL (Health Education AIDS Liaison), runs a "medical hypnosis" service and claims[10] that it is the shock of an HIV diagnosis that kills people because such a diagnosis creates "very toxic emotional states," which supposedly "knock out and undermine" the body's natural defenses. Repairing the victim's mental state is thus his solution to AIDS—a convenient prescription given Ellner's line of work.

Roberto Giraldo, another member of HEAL who sits on the boards of organizations such as Rethinking AIDS and Alive and Well, describes himself as a "natural health counselor" and runs a clinic of "integral psycho immunology" in Brazil. Infamous for advising Mbeki's health minister on nutritional alternatives to ART, Giraldo subsequently went on to promote organized AIDS denialism in Latin America.

Cultropreneurs, and indeed all alternative therapists, rely on anecdotal evidence and testimonies of people who were pleased with their treatments. The "living icon," the person who through his or her very existence "proves" that HIV disease can be fought with alternative remedies, thus plays a crucial role in the cultropreneur's success. The most important of these icons for the AIDS denialist movement was Christine Maggiore, who not only actively promoted the cause of AIDS denialism but tragically also put her own health and that of her family on the line.

In the preface to her widely distributed book, *What if Everything You Thought You Knew about AIDS Was Wrong?*, Maggiore says she lost faith in HIV science after a series of inconsistent HIV tests. This prompted her to conduct her own investigation "outside the confines of the AIDS establishment" and to start her own organization, Alive and Well, to "share vital facts about HIV and AIDS that are unavailable from

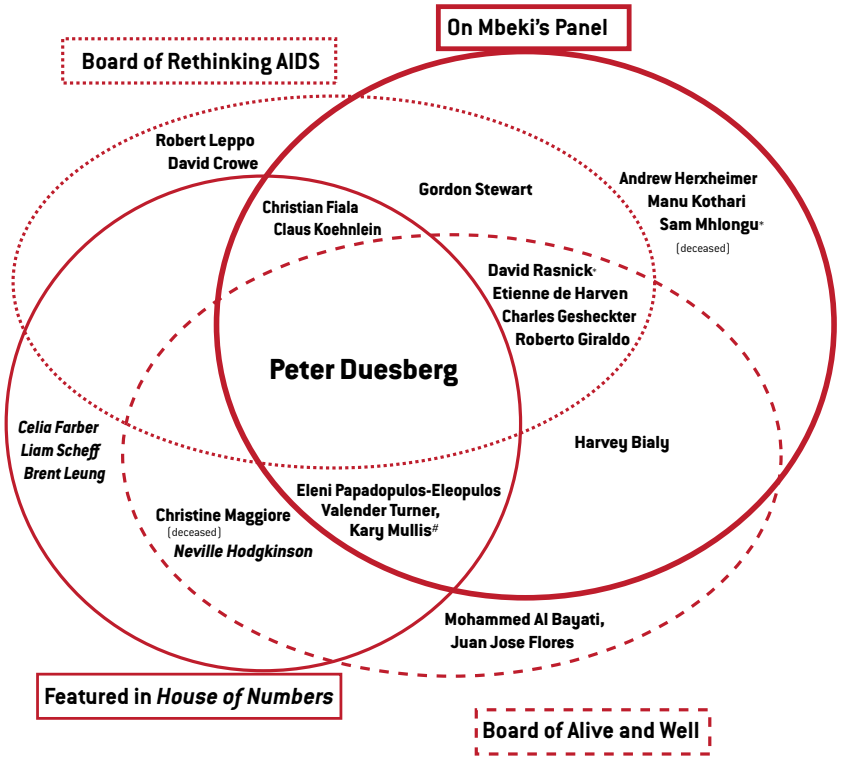

Figure 1. AIDS denialist networks. Names marked by an asterisk (*) are also linked to Mattias Rath (The Rath Health Foundation); name marked with a pound sign (#) was invited onto Mbecki's panel but did not attend; names in italics are journalists/filmmakers.

mainstream venues." Writing in 2000, she observed that her HIV status had been "decidedly positive" for five years, but that she was enjoying good health and was living "without pharmaceutical treatments or fear of AIDS."[11]

The saga of Maggiore's test results is a crucial foundational narrative for her as an AIDS denialist and features prominently in *House of Numbers*. Indeed a central AIDS denialist claim is that because different HIV tests can deliver different results, the entire edifice of AIDS science is flawed. Maggoire's test results are presented as a case in point.

The laboratory report shown in *House of Numbers* purporting to be Maggiore's first HIV test result is a positive Elisa test (for the presence of HIV antibodies) and a positive Western blot test (for HIV antigens) showing reactive bands for the p24 and gp120/160 antigens but not for p31. The absence of p31 suggests either a relatively new HIV infection or a 4.8 percent chance of a false positive test—thus the correct procedure in such a scenario is to counsel patients that the result is inconclusive and further testing is necessary.

Maggiore states that the second test came back "indisputably positive" and she was told that she had "five to seven" years to live and that her only treatment options were the eventual use of ART. Maggiore's response was to find another doctor who "didn't routinely fill people with toxic pharmaceuticals and lethal predictions" and to conduct further tests. These were apparently indeterminate, positive, negative, and positive. Evidence for the negative test result is unclear, however, as the clip shown in *House of Numbers* focuses on a fragment of the test result that shows nothing demonstrative of a negative result. But when the film shows the final test result, it is clear that all bands on the Western blot are positive for HIV antigens—an unequivocally positive result.

Maggiore concludes from her experience that HIV tests are "unreliable and inaccurate." Yet the progression of her HIV tests from indeterminate to positive is consistent with her first test having been conducted soon after she became infected with HIV and subsequent tests being performed in line with clinical practice and culminating in an unambiguously positive test result.

Maggiore's book, endorsed by Duesberg, Rasnick, and Mullis, is a good illustration of AIDS denialist tactics. The first tactic is to deny the evidence. Thus, in her section on ART, Maggiore makes the baldly false statement that four years into the era of highly active antiretroviral treatment "there are still no reports in scientific journals that provide evidence for health improvement in patients taking these powerful drugs." The second tactic is to dismiss the evidence that does not suit the case; for example, to reject studies showing that CD4 counts (an indicator of immune functioning) improve for people on ART because they are "surrogate markers" of the presence of HIV.

When she was pregnant in 2002 with her second child, Maggiore was featured on the cover of *Mothering* (a now-defunct pro-alternative healing and anti-vaccination magazine) with a red circle slash symbol over the letters "AZT" (an antiretroviral drug used to reduce the chances of transmitting HIV from mother to child) emblazoned across her abdomen. After the baby, a daughter called Eliza Jane, was born, Maggiore increased the risk of transmitting HIV to the baby yet further by breastfeeding her. Tragically, Eliza Jane died at age three of what the Los Angeles coroner ruled to be AIDS-related pneumonia. Seven weeks earlier, Maggiore had stated on a radio show that her children had "excellent records of health," yet the coroner reported that Eliza Jane was under-weight, under-height, and had pronounced atrophy of her thymus and other lymphatic organs. He found *Pneumocystis jirovecii*, a common AIDS-related opportunistic infection that is the leading cause of pediatric AIDS deaths, in the baby's lungs and protein components of HIV (p24) in her brain.

After her daughter Eliza Jane was born, AIDS denier Maggiore increased the risk of transmitting HIV to the baby yet further by breastfeeding her. Tragically, Eliza Jane died at age three of what the Los Angeles coroner ruled to be AIDS-related pneumonia.

Maggiore and her supporters, however, denied that HIV had anything to do with the death, relying instead on a rival report by Alive and Well advisory board member Mohammed Al Bayati, an animal toxicologist who is neither a medical doctor nor board-certified in human pathology and who consults on "health issues related to AIDS, adverse reactions to vaccines and medications" for $100 per hour.[12] According to him, Eliza Jane died because of an allergic reaction to an antibiotic.

Maggiore also raised questions about the autopsy tests and dismissed the presence of p24 capsid protein in Eliza Jane's brain (a clear indication of HIV infection) as being the result of a medical "scavenger hunt" designed to make an HIV diagnosis. Farber agreed, writing that the coroner had gone out of his way to make the death look like it was AIDS-related simply because she was Maggiore's child. Farber attributed pub-

lic anger against Maggiore for Eliza Jane's death—manifested in angry emails, web postings, and even printed flyers—to "the impossibly censorious and even brutal treatment one can expect if one is branded an 'AIDS denialist.'" She observed:

> I started to see the story as one that was less and less medical, more and more psycho-social—a story of an almost crushing kind of mob rule, where the victims have no rights. Few could resist the delicious temptation to condemn a "denialist" mother, or to appropriate EJ as their own tragic little girl. It was all done in the pitch-perfect tones of the AIDS morality play some of us know so well.[13]

Farber's argument is remarkable for its failure to consider that Eliza Jane was the victim in this instance, and that the "AIDS morality play" she sneers at is rooted in genuine social concern about the wellbeing of children. As Wainberg put it, "Maggiore was so misguided in believing this concoction of bullshit, that it cost not only her life, which is her business, but also the life of her three-year old kid, and that is everybody's business."[14]

John Moore (a virologist) and I made a similar point, arguing in a *New York Times* op-ed ("Deadly Quackery," June 4, 2006) that those who stand in positions of authority, be it president of a country (Mbeki) or a parent, should not indulge their own intellectual questionings and rejection of the scientific consensus when it is others who pay the price. This prompted a subsequent email exchange with Maggiore—later posted by Rethinking AIDS on the Internet[15]—which is illuminating for the way in which scientific evidence is immediately deflected by AIDS denialists with further questions as if the questions themselves are sufficient to dismiss the evidence. Maggiore questioned our conclusion (based on the coroner's report) that Eliza Jane had died of AIDS and asked me to explain "how does Eliza Jane's eight-year-old brother, raised in the same manner as his sister, test HIV negative?" She also disputed our observation that she was spreading "dangerous views" by claiming she was simply raising "unanswered questions" in the hope of being provided with "answers and references."

I subsequently provided her with references showing high death rates among untreated HIV-infected children and pointing to the benefits of ART in extending life (and she predictably responded by raising problems with the design of the trials, including their reliance on "surrogate markers" and denying that there had been any scientific advance showing how HIV causes AIDS). When I argued that not all children born to HIV-positive mothers test negative, and hence that her son Charlie was one of the "lucky ones," she responded by asking for a "more cogent explanation."

I also expressed the wish that

> When you reach the stage when HIV has undermined your immune system sufficiently to start causing you serious health problems, I sincerely hope that you start taking antiretroviral therapy. By all accounts, you are a good mother to Charlie, and it would be sad for him to lose you unnecessarily early. Three of the survey fieldworkers who work in my research centre started antiretroviral treatment in the past two years and they are all doing very well—and one of them even gave birth to a (HIV-negative) child. This is all great cause for celebration and hope in this horrible epidemic.

She responded by pointing out that she was in her fourteenth year of living with HIV "with no medications and no health problems" and asking rhetorically, "How long do you suppose I might expect to continue in this way?"

(Although Maggiore lived longer than average, she eventually progressed to AIDS and died three years later. Most people progress from HIV infection to AIDS within ten years, but 5 to 15 percent are able to fight off the infection for much longer—a feat scientists believe is genetic.) With regard to my fieldworkers, she said:

> How do you measure "doing well"—clinical health, lab markers? I know a great number of HIV positive women who have given birth to HIV negative children without taking anti-HIV meds. The common factors among them are natural good health prior to testing positive, excellent nutrition, regular use of vitamin supplements, regular exercise, no use of AIDS meds, prescription drugs or street drugs, no smoking or drinking. Why are their experiences not "cause for celebration and hope" for a healthy, low cost alternative to toxic drugs whose long-term effects on mother or child remain unknown?

In other words, our exchange was clearly fruitless. It illustrates how people in denial can, as psychologist Seth Kalichman observes, construct a reality that is "impenetrable by facts."[16] When Eliza Jane died, Maggiore told reporters: "I have been brought to my emotional knees, but not in regard to the science of this topic. . . . I am not second-guessing or questioning my understanding of the issue." Maggiore remained in denial to the end, dying in 2009 at the age of fifty-two of bilateral bronchial pneumonia and disseminated herpes viral infection, each of which is a common AIDS-related opportunistic infection. That she was prepared to endanger her own life, and that of her family, speaks volumes about the passion and sincerity with which AIDS denialist beliefs can be embraced and to the powerful psychological forces at work within those beliefs.

A professional independent pathologist conducted an autopsy on Maggiore, but the report was never released by the family. Instead, Al Bayati offered a predictable "interpretation" of it—namely that despite the presence of AIDS-defining conditions, Maggiore, like her daughter, had died of antibiotic poisoning. Clark Baker, a retired traffic cop and active AIDS denialist, came up with a variation on the typical AIDS conspiracy theory, stating that "it is clear that corrupt officials from within the LA County Department of Health have pressured officials into making false claims that Maggiore and her daughter died of HIV so that pharmaceutical marketers could induce useful media idiots to perpetuate the myth on their behalf."[17]

The death of this important living icon was obviously a hard blow for organized AIDS denialism. Maggiore's organization Alive and Well posted a memorial notice when she died, but visitors to the website today are still greeted with a "message" from Christine Maggiore on the "about us" page that gives no indication that she is dead.[18] Anti-AIDS denialist sites respond to such attempts to obscure and downplay the deaths of living icons by publicizing them—see for example www.aidstruth.org/denialism/dead_denialists. Other attempts have been made to create new "living icons"—for example, the people profiled on a website called We Are Living Proof[19]—but none of them comes close to being able to replace Maggiore's symbolic and organizational power.

The symbolic importance of Maggiore—and now of her death—is illustrated in this posting by a one-time AIDS denialist. He talks about how his "dissident" beliefs encouraged him to ignore his positive HIV test result, but that when he heard that Maggiore had died, alarm bells started ringing for him for the first time:

> In 2008 I had bumped into the website aidstruth.org and, while reading it in a "yeah blah blah whatever" kind of attitude, I saw the "denialists who have died" and "who the denialists are" sections. Something clicked. And very soon after I paid one of my usual visits to the Alive and Well site and found the memorial text about Maggiore's death. It didn't mention the cause (of course) so I Googled away thinking "please, let it be a traffic accident or something," and bam! Pneumonia. . . .
>
> You know how denialists usually say it's just a coincidence, like "why not? Anybody can have pneumonia," but having recently read the list of dead denialists and wondering if those weren't too many untimely coincidences, for me Maggiore's death is where I drew the line. For me it was the "one too many" coincidence. That's where I secretly started to wonder if I had been wrong.[20]

That [Maggiore] was prepared to endanger her own life, and that of her family, speaks volumes about the passion and sincerity with which AIDS denialist beliefs can be embraced and to the powerful psychological forces at work within those beliefs.

Medical science is more trustworthy than alternative medicine precisely because the former is built on randomized controlled trials, whereas the latter rests on anecdotes and individual testimonies. It is thus somewhat ironic that a single death—Maggiore's—has possibly done more than scientific rebuttals to fight AIDS denialism. Precisely because this death was that of a living icon who rejected HIV science in favor of alternative therapies, it carried disproportionate weight for those tempted by AIDS denialism. It illustrates how the battle for science and reason is not always just about "the facts," as some facts are symbolically more important than others. ■

Notes

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20. http://denyingaids.blogspot.com/2010/07/how-aids-denialism-can-kill-you-part.html

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Eyewitness to the Paranormal: The Experimental Psychology of the 'Unexplained'

Research in experimental psychology has shown that many paranormal sightings fall directly within the realm of eyewitness memory. Experiments reveal that such "sightings" derive from the psychology of the observers rather than from supernatural sources. Experiments show these proclivities.

MATTHEW J. SHARPS

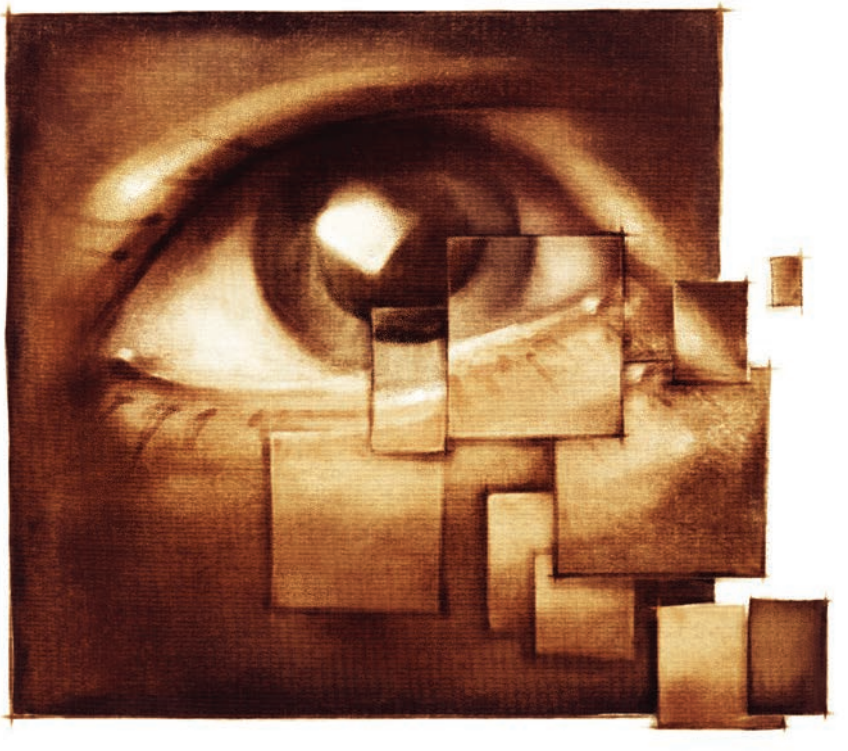
If many sources on cable TV and the Internet are to be believed, the world is currently under attack by a variety of supernatural forces, apparently acting in concert.

Such reports are ubiquitous. Aliens appear at night on deserted country roads. The ghosts of hoary and defunct Scottish peers turn up on castle battlements, demanding retribution for ancient defeats at the hands of the Sassenach. Bigfoot, all eight or nine feet of him, runs past a given cabin on his way to some cryptozoological tryst—and all of it winds up on television.

What, exactly, is going on?

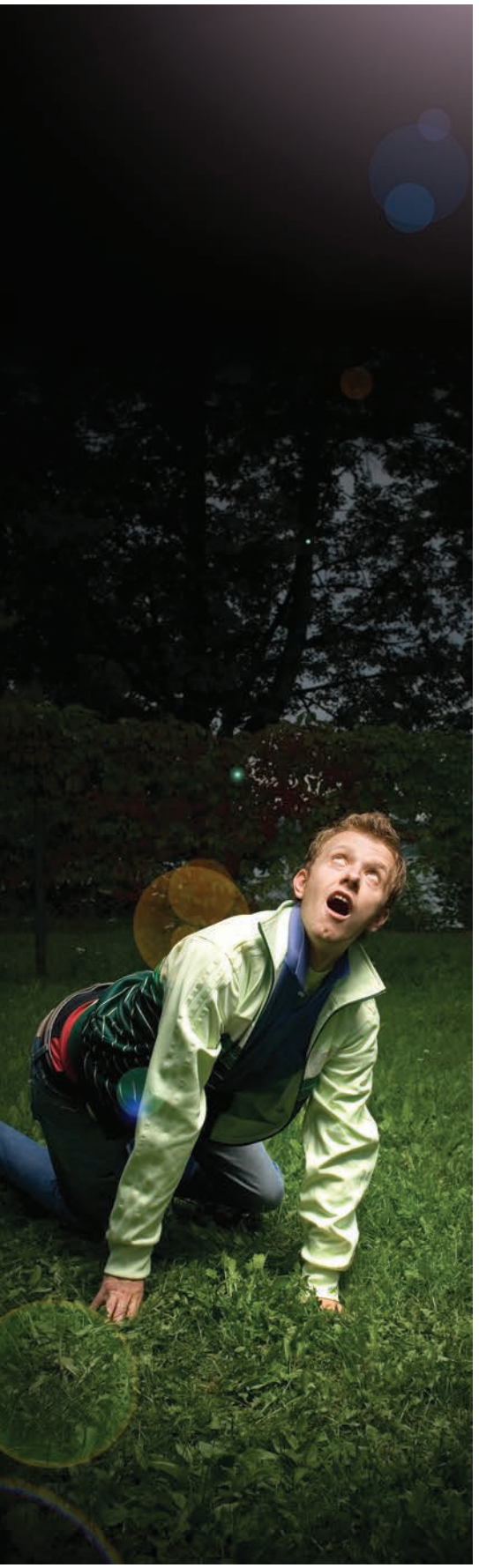
There is a difficulty in explaining many of these paranormal "sightings." At first, one might expect that the witnesses to these phenomena would be residents of the wilder shores of psychological instability; however, many of the people who report these things are sober, educated, reasonable individuals. Many are actively adverse to publicity, and an appreciable fraction of them passes polygraph tests. In short, many of these witnesses—in fact, probably the majority of them—are neither lying nor mentally ill. They have normal nervous systems, and they are convinced that they have experienced something extraordinary.

Logically, therefore, there are only two viable explanations for the events these people claim to experience. Either Bigfoot, the ghosts, and the Gray aliens actually exist, or the individual witnesses to these exotic beings have actually observed *and misinterpreted* relatively prosaic phenomena. If the latter is the case, then these misinterpretations are very literally eyewitness errors and, as such, are governed by the same psychological principles that operate in eyewitness processes in the forensic world.



Eyewitness Memory and the 'Paranormal'

On average, most of us think of eyewitness memory in relatively narrow terms, such as criminal identification via police lineups. In fact, the eyewitness field has much broader significance both in the criminal justice system and beyond.



Every human phenomenon involving reportage—from recall of childhood memories in psychotherapy to the observation of a planetary transit—coalesces around some kind of account of some variety of human experience. This means that the processes involved in eyewitness cognition *per se* are continually operating, albeit at a relatively subtle level, through the entire fabric of human existence.

Unfortunately, eyewitness memories are frequently wrong. In my own work I have found that people, including and perhaps especially jurors, tend to think of the human nervous system as some kind of digital recorder, faithfully reproducing what we've actually seen when, in fact, nothing could be further from the truth. Eighty years ago (Bartlett 1932) it was demonstrated that human memories become *reconfigured*—changed in terms of gist, brevity, and personal belief. Our memories lose detail; they become shorter; and what we *think* we've seen frequently replaces what we've *actually* seen. These aspects of human memory have been reconfirmed by modern studies (e.g., Ahlberg and Sharps 2002) and have been shown as far back as the 1970s to be directly important for eyewitness memory; for example, Loftus (1975) showed that witnesses will typically "remember," and confidently report, the color of a barn in a given scene as red *even when there is no barn in the scene to be observed*. This illustrates the effect of personal belief on an individual's memory. People generally expect barns to be red; therefore, when Loftus asked experimental witnesses for the color of the barn they had seen, their imaginations obligingly provided the most typical color even though no actual barn had been presented to them.

Our recent experimental research has underscored this effect (Sharps et al. 2009; see also Sharps 2010). In studies of witness errors derived from a violent crime scene, the most prevalent error (an average of nearly two errors of this type per witness) was a mistake in the physique or clothing of a gun-wielding perpetrator. However, the second most prevalent error (an average of 1.25 errors of this type per witness) was one of "inference, extrapolation, or imagination": in other words, the average witness simply made up, out of whole cloth, one and one-quarter nonexistent "facts" about a given violent crime.

'Seeing' the Supernatural

Human memory, therefore, is malleable: what you see is not necessarily what you get. This concept has obvious relevance to sightings of the "unexplained." It is clearly possible for a human being—for example, at twilight when visual acuity is reduced—to see an angry cow behind a bush but come out of the situation with a clear memory of a menacing Bigfoot. A wisp of fog or smoke seen in the indirect glare of a streetlight becomes a ghost; the bright lights of a factory, seen at night through an industrial haze, become a UFO.

Yet how does a given witness transform the prosaic into the miraculous? What are the psychological processes *operating in a normal person* by which this transmutation is to be accomplished? In other words, what psychological factors would be likely to turn prosaic reality into a supernatural or paranormal representation in the mind?

The Psychology of Atypical Perception

My students and I (Sharps et al. 2006) focused on three specific psychological characteristics—depression, dissociation, and tendencies toward attention deficit hyperactive disorder (ADHD)—in a study of seventy-eight adults. This study employed standardized instruments for the measurement of ADHD, dissociation, and depression in each respondent and evaluated these measurements against respondents' self-ratings of paranormal beliefs of various types. We chose these characteristics for two reasons.

The first reason is that while none of these conditions is something you'd want to have, *none constitutes mental illness per se*. Although these conditions may, at their higher levels, become classifiable as symptoms of mental illness, at their lower, everyday levels, virtually everyone experiences depression or dis-

sociation at times. Even symptoms of ADHD are distributed normally in large populations (Buitelaar and Van Engeland 1996). In other words, you don't have to have a diagnosable condition of ADHD to have a *little* ADHD. Subclinical, non-diagnosable levels of these three conditions are highly prevalent in the human population.

The second reason we focused on these three conditions is that they make sense as potential predisposing agents for belief in and perception of the paranormal. Consider ADHD, especially those forms that involve a degree of hyperactivity. Individuals with these characteristics tend to be attracted to active, exploratory activities and lifestyles (Barkley et al. 2008) similar to those often depicted in science fiction. Therefore, it makes sense that people with subclinical levels of ADHD might find themselves thinking about, wishing for, and believing in strange and menacing animals such as Bigfoot and the Loch Ness monster, or in UFOs and space aliens, which would provide evidence of adventurous possibilities beyond the Earth.

Similar considerations apply to the depressed, although these involve different paranormal objects. While we could find no reason why a depressed person would be attracted to Bigfoot, ghosts are another matter—they represent the prospect of an afterlife in which things might get better. Also, the depressed might be more likely to believe in aliens and their UFOs as well: an abundance of movies and TV programs preaches the joys of being selected for a benevolent alien abduction, removed from earthly torments, and presented with exotic new cosmic possibilities.

What about dissociation? People with some level of dissociation tend toward a diminished critical assessment of reality. Dissociated people may feel "strange" about themselves, even to the extent of feeling that they are undergoing out-of-body experiences. They may have anomalous perceptions of the passage of time or of their own experience. The world may appear to be "not quite real or … diffuse" (Cardena 1997, 400). This disconnection with reality might incline those with even subclinical levels of dissociation to view impossible or highly improbable things with an enhanced level of credulity. For this reason, it was anticipated that people with dissociative tendencies would be prey to paranormal beliefs at higher levels than the general population. However, here we see no thematicity as we did with depression or ADHD; in short, we would not expect individuals with dissociation to focus on any specific *area* of the paranormal.

Therefore, we hypothesized a higher degree of belief in "cryptids" (unknown animals such as Bigfoot) and in aliens for those with ADHD tendencies; a higher degree of belief in aliens and ghosts for those with depressive tendencies; and a generally higher level of nonspecific belief in the paranormal for those with dissociative tendencies.

Experimental Confirmation

These hypotheses were entirely supported by the empirical results of our study (Sharps et al. 2006). We found this result exciting because, for the first time, we had proof of the involvement of specific psychological processes in paranormal beliefs. Very specific human psychological characteristics can be used to predict belief not only in supernatural prospects generally, but also in specific kinds of paranormal "beings." In view of abundant research demonstrating the malleability of memory in the face of personal beliefs, this research clearly brings belief in the paranormal into the realm of predictive scientific psychology. What you are like as a person contributes in scientifically predictable ways to what you're willing to believe.

However, this initial study addressed *belief*, not *perception*. While we would theoretically expect belief to drive perception, the question of perception itself is another matter. There is, after all, a significant difference between believing that there might be a Bigfoot and seeing one in your yard. What evidence is there that specific psychological characteristics drive the tendency to *see* paranormal things, to misinterpret the prosaic as if it were the fantastic?

Very specific human psychological characteristics can be used to predict belief not only in supernatural prospects generally, but also in specific kinds of paranormal "beings."

Why We See Things That Aren't Really There

My students and I addressed this issue in a second study (Sharps et al. 2010) of ninety-eight adults, using the same standardized instruments for the measurement of dissociation, ADHD, and depression. We acquired from public-domain Web sources a series of digital photographs purporting to depict Bigfoot, space aliens, or ghosts, which we then presented in counterbalanced series to our respondents via PowerPoint. Respondents were asked to rate the probability that the given photograph actually depicted the Bigfoot, ghost, or alien in question.

This study, then, tested directly the effects of psychological characteristics on *the tendency of an individual to identify a stimulus item as paranormal in nature*. In this study, dealing with effects on *perception* as opposed to *belief*, the influence of neither ADHD nor depression was sufficiently powerful enough to influence perception. However, dissociation strongly predicted the

tendency to perceive a given photograph as actually depicting a paranormal being. More specific analyses demonstrated that this influence of dissociation was significant for Bigfoot and for aliens but not for ghosts. Thus, although the effects of psychological characteristics were shown to be different and more limited for perception than for belief, the overall effect was confirmed: *those with dissociative tendencies were more likely to identify "beings" as genuinely paranormal or supernatural than were those without these tendencies*. Since the majority of human beings report some dissociative experiences (DePrince and Freyd 1999), this result may be of substantial interest in explaining the burgeoning numbers of paranormal beings infesting our cable television.

Experiments in Context

These studies showed us two things. First, people with identifiable psychological profiles are not only more likely to believe in the paranormal or supernatural, but their psychological tendencies may also be used to predict the exact types of "unexplained" phenomena in which they are likely to believe.

Second, one of these psychological characteristics—a tendency toward dissociation—allows us to predict individual proclivities toward seeing a given stimulus item as a paranormal creature, whether Bigfoot or an alien.

Seeing Is Not Believing

It should not be surprising that the influence of psychological factors on perception is different from that influence on belief. Beliefs in the paranormal can be "gestalt" (Sharps 2003, 2010), lacking immediate direct challenge from the physical environment; people can believe in Bigfoot, for example, without actually expecting to *see* one. However, *perception* of a given paranormal being is much more immediate and feature-intensive; therefore, some psychological tendencies that influence belief may not be powerful enough to alter feature-intensive perception of immediate reality—to actually transform a bear into a foraging Sasquatch. Only dissociation, we found in our experiments, is sufficiently powerful to influence both belief and perception, to propel a real-world stimulus into the realm of the paranormal.

Only dissociation, we found in our experiments, is sufficiently powerful to influence both belief and perception, to propel a real-world stimulus into the realm of the paranormal.

Why Don't the Dissociated 'See' Ghosts as Well as Cryptids and Aliens?

Bigfoot and alien perceptions were subject to the effect of dissociation, but ghost perceptions were not. Why? In Western culture, cryptids and aliens are largely perceived as "fringe" constructs. Ghosts are less so; for example, many sober individuals, the late novelist Michael Crichton among them (1988), feel and report a strong conviction that a dead loved one is "present" in the mortuary or at that person's funeral. In short, "seeing" or "feeling" a ghost may be more socially legitimized than the same perception of a cryptid or a space alien, with a resulting enhancement in feelings of credulity. If so, this phenomenon points to the need for further research on the intersection of culture with individual psychology in this area.

A person need not, in any technically accurate sense, be mentally ill to "see" a paranormal "being." This is a crucial caveat. Our respondents were not in any sense "crazy" or mentally ill. All three of the conditions addressed are those that many people in the normal population experience at subclinical levels. These were normal people, yet their proclivities in these regards made them particularly susceptible to beliefs and perceptions of a paranormal or supernatural type. Since normal people in their everyday lives are not typically subjected to psychological analysis of their subclinical tendencies, we are faced with an interesting fact: *anybody* could be the person who sees Bigfoot or a space alien emerging from his UFO. The unfortunate individual who sees such a thing is vanishingly unlikely to know of the psychological quirks that rendered the given observation—or rather its interpretation—possible.

Why do we characterize such a person as unfortunate? This is a critical point, more important than it may at first appear. If searching for Bigfoot, looking for the Loch Ness monster, or delving after little green men from the planet Grak were merely a pleasant diversion, an excuse to hike in the woods and deserts or to buy a really good telescope, there would be little reason to extend scientific anathema to these concepts. These ideas obviously don't elevate the level of scientific discourse; but beyond that, for most people, what's the harm?

Unfortunately, these ideas *can* prove harmful. Much of the evidence is anecdotal or derived from popular sources, but it appears that an encounter with the perceived paranormal can be a life-damaging if not life-destroying experience. Social, marital, and economic harm can readily accompany the obsessive interest of a "contactee" whose life, relationships, and career are derailed by the conviction that "the truth is out there." The author alone has known intelligent individuals whose lives of semi-employment and solitude have resulted at least in part from the search for nonexistent beings from beyond; none of this is necessary, for the simple reason that we now understand what brings human beings, with human nervous systems, to paranormal perceptions and beliefs. We can

now demonstrate, using well-established methods of experimental psychology, that the human mind is perfectly capable of constructing the beliefs *and the perceptions* that frequently lead to a profitless search for the creatures of the Twilight Zone. We hope these findings will help lead intelligent, educated individuals to pursue the genuine mysteries of neuroscience, zoology, and astronomy to the exclusion of the useless pursuit of the phantoms that reside in the interstitial spaces of our infinitely inventive minds.

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The Top 20 Logical

by Jesse Richardson

Fallacies

(or should that be the bottom 20?)

A while ago I was trying to explain logical fallacies to my two boys, Daniel and Caleb.

They're smart enough kids, but they're still, you know, kids—and so I tried to come up with really simple ways of explaining the concepts behind some of the more common fallacies.

I found that distilling a fallacy into a single simple sentence (without using any big pretentious words) was something of a challenge, but because I'm an ad guy I had some "skillz" with regard to making sure the lowest common denominator could understand the message. (Not that my kids are the lowest common denominator, but you get my point.) So having simplified the explanations of some of the fallacies, I tried to come up with fun examples to go along with them. Then I thought, "Hey, what if I were to make these into a poster infographic that parents could hang on their kids' bedroom walls and fellow skeptics could hang in their offices and whatnot?" And that's how this project began.

After starting on the poster design, the idea of a website was a natural progression. To make it kind of fun, I bought the domain www.yourlogicalfallacyis.com with the idea that each fallacy would have its own directory so that the URL itself would become a kind of passive-aggressive comment to leave underneath the kinds of fallacious Facebook statuses, blog articles, forum posts, and random comments that might, on very rare occasions, appear on the Internet. For example, if someone commits a straw man fallacy, you simply post a reply with a link to www.yourlogicalfallacyis.com/strawman.

So anyway, now the website is up and the poster is free for anyone to download and print out at various sizes as high-resolution pdf files at yourlogicalfallacyis.com. I approached SKEPTICAL INQUIRER asking if they would be interested in publishing this article as a way to help spread the word that there's now a website that skeptics can use to tell people on the Internet exactly how and why they're wrong; so without further ado, here's the Top 20 Logical Fallacies:

straw man

Misrepresenting someone's argument to make it easier to attack.

After Will said that we should put more money into health and education, Warren responded by saying that he was surprised that Will hates our country so much that he wants to leave it defenseless by cutting military spending.

false cause

Presuming that a real or perceived relationship between things means that one is the cause of the other.

Pointing to a fancy chart, Roger shows how temperatures have been rising over the past few centuries, while at the same time the number of pirates has been decreasing; thus pirates cool the world and global warming is a hoax.

3 slippery slope

Asserting that if we allow A to happen, then Z will consequently happen, too; therefore, A should not happen.

Colin Closet asserts that if we allow same-sex couples to marry, then the next thing we know we'll be allowing people to marry their parents, their cars, and even monkeys.

4 ad hominem

Attacking your opponent's character or personal traits instead of engaging with their argument.

After Sally presents an eloquent and compelling case for a more equitable taxation system, Sam asks the audience whether we should believe anything from a woman who isn't married, was once arrested, and smells a bit weird.

5 appeal to emotion

Manipulating an emotional response in place of a valid or compelling argument.

Luke didn't want to eat his sheep's brains with chopped liver and Brussels sprouts, but his father told him to think about the poor, starving children in a third-world country who weren't fortunate enough to have any food at all.

6 the fallacy fallacy

Presuming that because a claim has been poorly argued, or a fallacy has been made, that the claim is necessarily wrong.

Recognizing that Amanda had committed a fallacy in arguing that we should eat healthy food because it was popular, Alyse resolved to eat bacon double cheeseburgers every day.

7 tu quoque

Avoiding having to engage with criticism by turning the accusation back on the accuser.

The blue candidate accused the red candidate of committing the tu quoque fallacy. The red candidate responded by accusing the blue candidate of the same, after which ensued an hour of back and forth criticism with not much progress.

8 personal incredulity

Saying that because one finds something difficult to understand it therefore must be not true.

Kirk drew a picture of a fish and a human and then with effusive disdain asked Richard if he really thought we were stupid enough to believe that a fish somehow turned into a human through just, like, random things happening over time.

9 special pleading

Moving the goalposts or making up exceptions when a claim is shown to be false.

Edward Johns claimed to be psychic, but when his "abilities" were tested under proper scientific conditions, they magically disappeared. Edward explained this by saying that one had to have faith in his abilities for them to work.

10 loaded question

Asking a question that has an assumption built into it so that one cannot answer it without appearing guilty.

Grace and Helen were both romantically interested in Brad. One day, with Brad sitting within earshot, Grace asked in an inquisitive tone whether Helen was having any problems with a drug habit.

11 bandwagon

Appealing to popularity or the fact that many people do something as an attempted form of validation.

Shamus pointed a drunken finger at Sean and asked him to explain how so many people could believe in leprechauns if they're only a silly old superstition. Sean, however, had had a few too many Guinnesses himself and fell off his chair.

12 appeal to authority

Using the opinion or position of an authority figure, or institution of authority, in place of an actual argument.

Not able to defend his position that evolution "isn't true," Bob says that he knows a scientist who also questions evolution (and presumably isn't a primate).

13 genetic

Judging something good or bad on the basis of where it comes from or from whom it comes.

Accused on the 6 o'clock news of corruption and taking bribes, the senator said that we should all be very wary of the things we hear in the media because we all know how very unreliable the media can be.

14 begging the question

A circular argument in which the conclusion is included in the premise.

The word of Zorbo the Great is flawless and perfect. We know this because it says so in "The Great and Infallible Zorbo's Best and Most Truest Things That Are Definitely True and Should Not Ever Be Questioned."

15 appeal to nature

Making the argument that because something is natural it is therefore valid, justified, inevitable, or ideal.

The medicine man rolled into town on his bandwagon offering various natural remedies, such as very special plain water. He said that it was only natural that people should be wary of "artificial" medicines, such as antibiotics.

16 anecdotal

Using personal experience or an isolated example instead of a valid argument, especially to dismiss statistics.

Jason said that his grandfather smoked, like, thirty cigarettes a day and lived to be nintey-seven, so don't believe everything you read about meta analyses of sound studies showing proven causal relationships between smoking and lung cancer.

17 burden of proof

Saying that the burden of proof lies not with the person making the claim but with those who deny the claim.

Bertrand declares that a teapot is, at this very moment, in orbit around the Sun between Earth and Mars, and that because no one can prove him wrong his claim is therefore a valid one.

18 ambiguity

Using double meanings or ambiguities of language to mislead or misrepresent the truth.

When the judge asked the defendant why he hadn't paid his parking fines, the defendant said that he shouldn't have to pay them because the sign said "Fine for parking here" and so he naturally presumed that it would be fine to park there.

19 no true scotsman

Making what could be called an appeal to purity as a way to dismiss relevant criticisms or flaws of an argument.

Angus declares that Scotsmen do not put sugar on their porridge, to which Lachlan points out that he is a Scotsman who puts sugar on his porridge. Angrily Angus yells that Lachlan cannot be a true Scotsman if he sugars his porridge.

20 black or white

Presenting two alternative states as the only possibilities when in fact more possibilities exist.

While rallying support for his plan to fundamentally undermine citizens' rights, the Supreme Leader told the people they were either on his side or on the side of the enemy.

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Political Myths that Influence Voters

By taking advantage of political myths, politicians convey subconscious messages in their political speeches to persuade voters. In America, conservatives and liberals use two different political myths to appeal for votes.

JEFFREY S. VICTOR

Many political appeals to voters hide subconscious messages. Advertisers are well aware of the influence that subconscious associations have on selling products from cars to cornflakes. Political consultants are equally aware of the persuasive powers of subconscious messages, as in the famous "Willie Horton" political ads used in 1988 to evoke racial concerns among voters. European scholars, too, understand the power of what they call "political myths" to exert a subconscious political influence; yet American social scientists continue to neglect in their studies the power of imagination in politics. In this hotly contested American election year, it seems useful to consider some of the key political myths used to affect voters.

The eminent French social historian Raoul Girardet broke ground in his insightful book *Mythes et Mythologies Politiques* (1986). Girardet recognized that political myths in contemporary societies play a similar role to sacred myths in traditional societies in that they appeal to symbolic, nonrational thinking. He suggests that political myths are embedded in all political ideologies as allegories that tap into the collective imagination of people's past history and future possibilities. Most of the time, political myths are simply part of public ceremonies and celebrations; however, during times of rapid change and disorganization, political myths are expressed in angry social movements, such as with today's Tea Party movement.

Italian political scientists Chiara Bottici and Benoît Challand (2006) define a political myth as "the continual process of work on a common narrative by which the members of a social group can provide significance to their political conditions and experience." They suggest that what defines a myth as specifically "political" is not its content but rather the meaning it provides for the political goals of believers.

How can we identify the political myth phenomenon? Political myths are obvious in stories from the distant past that purport to be true historical memories of events that convey pride in a people's nation. These stories are allegorical narratives composed of a mixture of true events, folk legends, exaggerations, distortions, and pure imagination. They are expressed in recurrent cultural themes and are created and transmitted by many forms of entertainment media, such as books, comics, television, and movies. These cultural themes also appear in public ceremonies, in speeches and rituals, and in school history books. Popular culture plays an important role in the dissemination of political myths, bringing their influence to the mass population. While political myths are embedded in popular culture, they are rarely expressed directly in political party ideologies. Instead, political myths can be found in the "buzz words" of political rhetoric.

Unfortunately, the term *myth* is commonly used to mean a false story; however, a myth can also be understood as a metaphor for reality. While parts of political myths may be total fabrications, others may have been verified by serious historical research. The imaginary parts of political myths should not distract us from the fact that these myths are real in the sense that they have a real impact upon the way people live. They frame the way people think about political behavior, such as organizing, voting, and promoting political policies. Political myths endure and evolve because they serve the psychological needs of millions of people. As its themes evolve, the myth's believers adapt it to fit current circumstances and their hopes for the future.

A political myth, then—like any myth—is best understood as a social process that is never completely fin-

ished. Political myths have generic similarities with contemporary (or urban) legends that have political effects. Some examples include the Jewish world conspiracy legend (Cohn 2006), the satanic cult legend (Victor 1993), and the baby body-parts legend (Campion-Vincent 2011). By creating constantly evolving storylines, collaborative behavior conveys both political myths and contemporary legends. Some contemporary legends are based upon centuries-old stories, as are most political myths. However, there are differences between these legends and political myths. Contemporary legends are disseminated mainly by rumors, although some are written into books and movie scripts. They also serve different psychological and social needs: whereas political myths serve to cultivate group pride, contemporary legends function to provide justification for ambiguous fears.

Political myths commonly inspire nationalist sentiment and pride in the superiority of one's nation. They inspire civic virtues and self-sacrifice for the sake of one's nation. (National myths and founding myths are other terms for the same social phenomena.) Political myths commonly portray the struggles of a people's origin, their special virtues, and the behavior necessary for their survival; they provide national ideals toward which people should strive and, like all myths, often provide heroes as role models for moral behavior. In most cases, they legitimize the power of dominant groups in a society (Miller 1995). However, some political myths can legitimize the resentment of minority groups as well.

French Political Myths

Most political myths are rarely questioned with a skeptical eye. Like religious myths, they are usually taken on faith. Thus, it is easier to become aware of the political myths of other countries than those of one's own.

The "Myth of the Revolution" is an example of a political myth that is central to understanding French culture. This myth was created in the cauldron of the French Revolution but is still very much alive in French culture today. At its core, the Myth of the Revolution highlights the class struggle between the miserable disadvantaged and the privileged wealthy and powerful. *A bas les lois d'exception* ("down with the laws of privilege") was a graffiti slogan that I saw painted on the wall of the Beaux Arts School in Paris during the events of 1968. Its message is constantly repeated in French literature, in movies, in French chansons, in the rhetoric of socialist political speeches, in the almost daily political demonstrations on the streets of Paris, and even in pop-culture musicals like *Les Miserables.* (The wording of the English language version had its revolutionary rhetoric toned down.)

The "Myth of Resistance" is another French political myth. In popular culture today, the French trace their origins not to the Germanic Francs but to the ancient Celtic Gauls (the Gaulois) who courageously resisted Roman invasion and occupation. This myth encourages autonomy and independence against a dominant power, against all odds. The heroic model of Joan of Arc demonstrates the ideal of resistance against a dominant foreign power. Joan, a teenage girl from Lorraine, supposedly led armies to liberate France from English dominance; the symbol for DeGaulle's resistance against the German occupation of France was the cross of Lorraine. Joan also provides a symbol for the French nationalist party, the Front National, which pays homage to Joan at its celebrations in front of her shining bronze statue on Place des Pyramides in Paris. Their ideology em-

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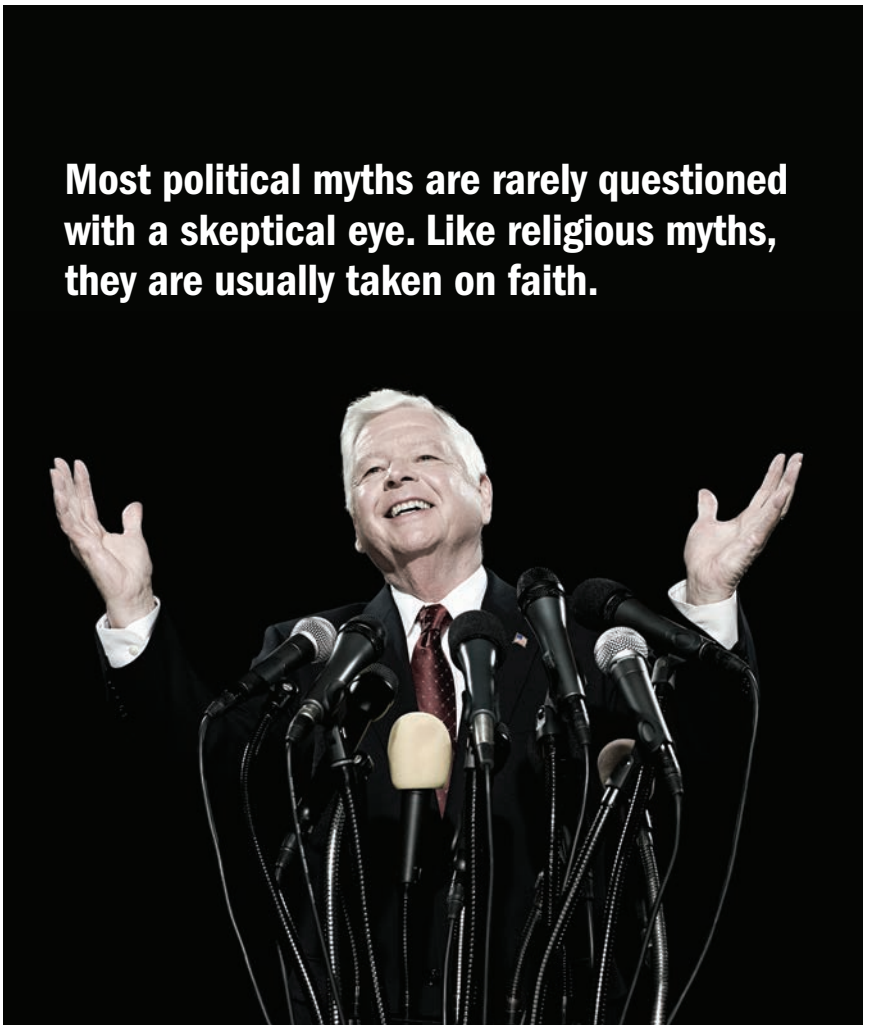

phasizes resistance to the "invasion of" (immigration into) France by Arab and black Africans from France's former colonies.

Even humorous popular entertainments reflect the resistance myth. One of the most popular figures in a French comic book series, the diminutive Asterix the Gaulois, leads the only ancient Gaulois village able to resist Roman occupation (by intelligence, courage, and magic potions). French criticism of the invasion of American culture—through fattening fast food, violent movies, and misogynist "rap" music—can be seen in light of the ideal of striving for independence against a dominant economic power.

Two important political myths affect American political dynamics today—the "Frontier Myth" and the "Immigration Myth." The symbolism of the Frontier Myth tends to inspire political conservatives, while the ideals of the Immigration Myth attract political liberals.

American Political Myths

It is easier to be skeptical of a political myth if it is one we do not believe. The "Lost Cause Myth of the Confederacy" is one such example (Gallagher and Nolan 2000). This myth portrays the cause of the South in the Civil War as a noble one, led by chivalrous men and fought by courageous volunteers in pursuit of the principle of states' rights. As the story goes, the South was outnumbered and overwhelmed by the brutal force of Northern armies. The myth asserts that the Civil War was not fought over the issue of slavery and that most slaves in the South were well treated. The myth was created by and perpetuated through popular literature, the political speeches of Southern politicians, and commemorative celebrations, and it was even spread by movies such as *Birth of a Nation* and *Gone with the Wind*. This political myth supported white power during the Jim Crow days; however, after the success of the civil rights movement, the narrative was contested and gradually lost credibility. It is still alive today among conservative white people in the rural South.

Two important political myths affect American political dynamics today—the "Frontier Myth" and the "Immigration Myth." The symbolism of the Frontier Myth tends to inspire political conservatives, while the ideals of the Immigration Myth attract political liberals.

Historian Frederick Jackson Turner expressed a clear statement of the Frontier Myth in his 1893 essay "The Significance of the Frontier in American History" (Turner [1893] 2009). He claimed that the settlement of the frontier gradually created an American culture different from those found anywhere else in the world. Turner suggested that the first settlers who arrived on the east coast in the seventeenth century thought and acted like Europeans; however, they encountered an environment vastly different from the one they had experienced in Europe—the forest wilderness, hostile natives, and most important, free or cheap land to farm. As they moved farther and farther west, the frontier borderlands became a place that reshaped their culture so that each successive generation pushing westward became less and less European and more distinctively American. Turner claimed that the new American culture was more democratic, more egalitarian, more distrustful of government authority, more individualistic, and also more violent than any in Europe. It required American men to have more self-reliant and independent characters and the ability to endure extreme conditions. Turner's ideas contributed to popular beliefs that Americans are a unique, superior, and virtuous people. President Ronald Reagan provided a perfect symbol for this political myth in the ideals he professed and with his cowboy hat as a political prop.

The Frontier Myth is essentially a national founding myth about the character of the people who made America. Popular and fine literature, such as the works of James Fenimore Cooper, narrated the challenges and struggle of the settlement of the western frontier, when the frontier was just beyond the east coast, and played a part in the gradual evolution of the Frontier Myth. Later, action-packed Western novels, movies, and television shows featured moralistic tales about courageous, lone men called upon to fight evil-doers. Most of these stories were one-dimensional, good versus evil, often featuring dark-skinned evil-doers—usually Indians or Mexicans. The "good guys" were almost always white Anglo-Americans. Ironically, many Western movie actors—Jews and Italians from Brooklyn—were given Anglo-American stage names. Such was the influence of the Frontier Myth on Anglo-American cultural dominance until the 1960s.

The Immigration Myth is embodied by the cliché that "we are all immigrants." This narrative focuses not on the struggle of individuals but rather on that of the many ethnic groups that came to America to find political and religious freedom and opportunities for economic advancement. The Immigration Myth emerged more recently than the Frontier Myth, though its roots go back to the first settlement of Anglo-Americans in North America. The myth developed from the experiences of the millions of immigrants who came to America from Southern and Eastern Europe beginning in the 1880s. However, it was only in the late

1970s, after the success of the civil rights movement, that popular culture began to romanticize immigration and ethnicity. Third generation Americans created many of these popular books and movies out of a kind of nostalgia over their lost cultural roots. The ethnic pride movement also gave rise to many sympathetic books and movies about Afro-Americans and Native Americans. These cultural products present a new vision of America in which ethnic minorities are not totally absorbed into Anglo-American culture but retain some worthy distinctiveness. The new pop culture celebrates ethnic diversity rather than Anglo conformity.

Descendants of Southern and Eastern Europeans, Catholics, and Jews now have a narrative expressing the reason why America is a unique and special nation among nations. In popular culture and its clichés, America has always been a refuge for the world's poor and persecuted. Pop culture portrays the United States as the only country that welcomes immigrants from countries around the world and claims that America attracts more immigrants than any other country. "Everywhere around the world, they are comin' to America," the Neil Diamond song espouses. The essence of this belief is that "We Americans are all immigrants." The central message of the Immigration Myth suggests that American society is a uniquely welcoming and tolerant society because America is the only nation composed of many diverse religious, racial, and cultural groups. This myth is not simply about the opportunity to earn a lot of money; it expresses the ideals of tolerance and social justice, which now inspire Americans whose ancestors came from Africa as slaves, as well as recent immigrants from Asia and Latin America. President Obama's professed ideals and mixed ethnic ancestry make him a perfect symbol for this myth.

Believers and Skeptics

It may be possible to scientifically verify some of the specific historical events that appear in political myths, and believers may point to these events as evidence of the myths' relevance today. Even if some specific events may be false, believers will regard the ideals in the myth as meaningful, just as people do with the ideals of religious myths, because it is the myths' ideals that are most important for believers. Some dogmatic believers, of course, will cling to all mythical accounts of the past as being true, ignoring or even suppressing any unpleasant past circumstances that run counter to their core political ideals. American high school textbooks have been at times censored by nationalistic right-wing guardians of virtue for this reason (McKinley 2010).

Many political myths offer a distorted nationalistic portrait of reality. The claim that the American frontier experience created a unique people, for example, runs counter to the reality that many other countries—such as Canada, Australia, New Zealand, South Africa, Mexico, and Brazil—had "frontiers" that included a wilderness and hostile natives displaced by invading Europeans. Each frontier experience is distinctive. Canada, for example, had a federal government that organized land settlement and sent in law enforcement agents (the Mounties) before most settlers arrived, thereby minimizing lawlessness and conflict with the Native Americans.

The claim that American society has always been a uniquely welcoming and tolerant society runs counter to the evidence of blatant prejudice and bigotry, beginning with racism toward black people and Native Americans, then anti-Catholic/anti-Irish prejudice, and later anti-Chinese hatred. The list is long. Also, contrary to the claim that the United States is unique in that it welcomes more immigrants than any other country, the evidence is that many industrial countries receive large numbers of immigrants. A recent United Nations report notes that in terms of the percentage of immigrants in relation to the national population, Australia has 19.9 percent; Canada has 18.7 percent; the United States has 12.8 percent; Germany has 12.3 percent; Sweden has 12.3 percent; and France has 10 percent (United Nations Department of Economic and Social Affairs 2006).

Most political myths arouse little skepticism. The stories persist and their truth is taken as self-evident because they serve important functions in the social system. The skepticism of serious researchers trained as historians, sociologists, or political scientists calls attention to the contradiction between unquestioned claims of truth and the evidence that many of the supporting claims and stories are exaggerations or total falsehoods. ■

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Dinodang: The Melon Rex Myth

To reconcile religious doctrine with dental morphology, some young-Earth creationists claim that tyrannosaurs ate melons. The history of this concept is as entertaining as it is absurd.

PHIL SENTER

We all have our little vices, our guilty pleasures. Enjoying young-Earth creationist (YEC) literature on dinosaurs is one of mine. As a paleontologist with a specialty in dinosaurs, I am familiar with and accept the evidence that dinosaurs and humans were separated by millions of years. In contrast, YEC literature asserts that ancient humans and dinosaurs coexisted. The fun of reading such literature is not in that assertion but in the more tangential claims that often accompany it. Some are so ridiculous that one marvels that their authors take their own claims seriously.

When writing about religious views I usually use wording that is diplomatic and respectful, avoiding ridicule. But dinosaur-related claims of this kind are nearly impossible to relate without betraying mirth. I call such claims "dinodang" (as in "Dang! I can't believe you actually said that!"), and among their number is the Melon Rex Myth.

In the children's book *Dinosaurs and the Bible* (Unfred 1990) we are asked to "examine more closely the teeth and jaws of *Tyrannosaurus rex*. The teeth are long and sharp—they seem to be just right for a terrible killer. But when we look closer, we can see a problem. The teeth have shallow roots. What do you think would happen if *Tyrannosaurus* sunk his teeth into the leg of a five-ton galloping *Triceratops*? He would probably leave a few of his best teeth behind! Although those long, sharp teeth of *Tyrannosaurus* may not have been good for fighting, they would be excellent for ripping the rinds off ripe melons." In the accompanying illustration, a *T. rex* holds a melon in its hands and takes a satisfying chomp. In a photo in a later YEC book a *T. rex* replica holds a watermelon in its mouth; the caption assures the reader that "*T. rex* originally ate vegetables" (McIntosh and Hodge 2006).

Such depictions are not limited to *Tyrannosaurus*, although it often gets special mention (Taylor 1987; Ham et al. 1990; Unfred 1990; Gish 1990, 1992; Ham 1998, 2006, 2009; Larsen 2001; McIntosh and Hodge 2006). In YEC children's books a pair of *Dilophosaurus* munches on leaves (Taylor 1987), a *Compsognathus* bites at a berry (Gish 1990), a *Ceratosaurus* chomps a banana frond (Ham 2001), a *Deinonychus* enjoys a meal of fruit (Ham 2001), and a *Carnotaurus* breakfasts on a bunch of bananas (Ham 2001). All of the above dinosaurs are theropods: members of Theropoda, the group of dinosaurs that includes *T. rex* and kin. The teeth of each are ziphodont—which means pointed, recurved, laterally compressed (flattened from side to side), and serrated on the fore and hind edges—clearly indicating a carnivorous diet (Figure 1). Among today's terrestrial animals, ziphodont teeth are present only in the lizard called the Komodo monitor (*Varanus komodoensis*), a carnivore (Auffenberg 1981). Among recently extinct species, the elongated canines of some saber-toothed cats are also ziphodont (Akersten 1985). The shark families Lamnidae (mackerel sharks, including the great white) and Carcharhinidae (requiem sharks, including the whitetip and bull shark) include members with nearly ziphodont teeth, all of which are carnivores (Compagno et al. 2005). The teeth of *T. rex* itself fit the ziphodont description except that they are wider from side to side (Figure 1). Holtz (2001) introduced the term *incrassate* for such teeth.

Paleontological Evidence

Several lines of evidence reveal that ziphodont-toothed theropods were carnivorous. Dinosaurs, like other reptiles, continuously shed old teeth, which were replaced from beneath by new teeth. As the crown of the replacement tooth developed next to the root of the old tooth, the root of the latter degenerated until the crown was no longer anchored and was shed, after which the replacement tooth would migrate into place (Sander 1997). As with extant reptiles, old tooth crowns were shed during feeding, allowing identification of the feeder. The fossil remains of Mesozoic prey carcasses are often surrounded by shed ziphodont theropod teeth (Bakker and Bir 2004), which indicates that such theropods fed on other animals.

Tooth marks on fossil bones also indicate carnivory for ziphodont-toothed theropods. Because they are thin from side to side, to avoid breakage ziphodont teeth must approach bone at an acute angle, and because of this angle such teeth often leave serration marks (Erickson and Olson 1996). The serration marks can often be matched with the serration size and shape of specific theropods, so the feeder can be identified. Tyrannosaurids (members of Tyrannosauridae, the family that includes *Tyrannosaurus rex* and its closest kin) left their tooth marks on the bones of hadrosaurs (the wide-snouted herbivorous dinosaurs commonly called "duckbills"), ceratopsians (horned her-

bivorous dinosaurs like the popular *Triceratops*), and even other tyrannosaurids (Jacobsen 2001; Fowler and Sullivan 2006). Tooth marks on North American sauropods (long-necked, herbivorous dinosaurs) from sites of the Jurassic age match the shed teeth of the theropod *Allosaurus* that surround the sauropod bones (Bakker and Bir 2004). *Deinonychus*, a close relative of the well-known *Velociraptor*, also left identifiable bite marks on the bones of its prey (Gignac et al. 2010). The distinctive tooth marks of the Madagascan theropod *Majungatholus* appear on bones of various Madagascan dinosaurs, including other *Majungatholus* (Rogers et al. 2003).

The thickened teeth of *T. rex* leave conclusively identifiable marks. Incrassate teeth can take a more dead-on approach to bone than ziphodont teeth can; although the angle of approach does not leave serration marks, molds of certain bite marks match the unique shape of *T. rex* teeth (Erickson and Olson 1996). Such marks are known from specimens of *Triceratops*, the hadrosaur *Edmontosaurus*, and even other *T. rex*es (Erickson and Olson 1996; Longrich et al. 2010).

Some evidence for theropod carnivory is more direct. Stomach contents within articulated skeletons of ziphodont theropods include a lizard (Ostrom 1978), a small mammal (Currie and Chen 2001), and a small dinosaur (Ji et al. 2007). Occasionally a ziphodont theropod tooth is found embedded in prey bone (Currie and Jacobsen 1995).

Obviously, then, *Tyrannosaurus rex* and its ziphodont-toothed counterparts were carnivores. So how could they handle this lifestyle with the shallow roots described by Unfred (1990)? They didn't have to, because Unfred is incorrect. Theropod teeth, including those of *T. rex*, had very deep roots (Figure 1), anchoring each firmly in the jaw until the replacement tooth began to develop beneath it.

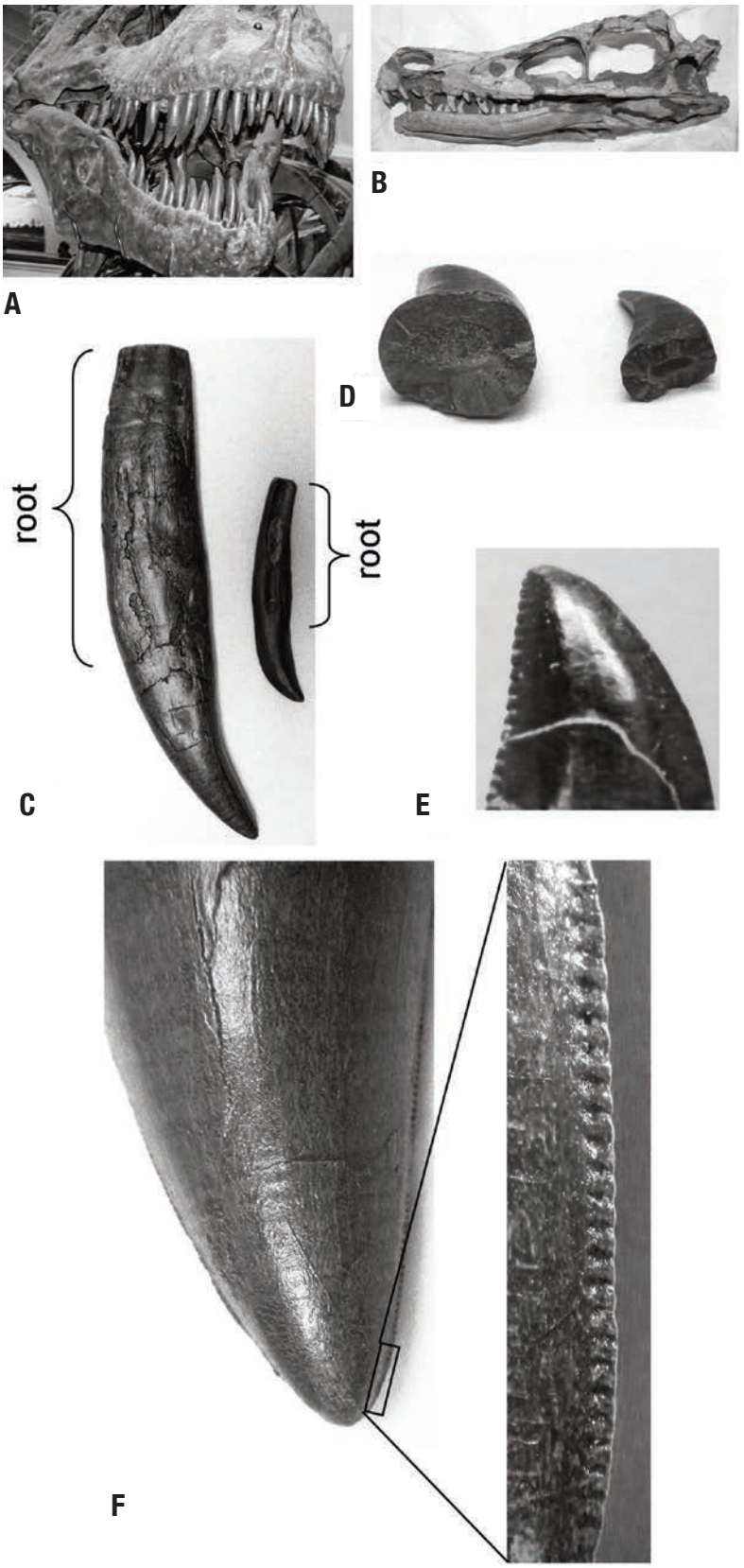

Figure 1. Teeth of carnivorous dinosaurs. (a) Incrassate teeth (cast of *Tyrannosaurus rex*). (b) Ziphodont teeth (*Velociraptor mongoliensis*). (c) Casts of an incrassate tooth (*Tyrannosaurus rex*, left) and a ziphodont tooth (*Allosaurus fragilis*, right), showing deep roots. (d) Casts of an incrassate tooth (*T. rex*, left) and a ziphodont tooth (*Gorgosaurus libratus*, right), showing the difference in cross-section between the two tooth types. (e) Ziphodont tooth (*Deinonychus antirrhopus*) showing serrations. (f) Cast of *T. rex* tooth with enlargement showing serrations.

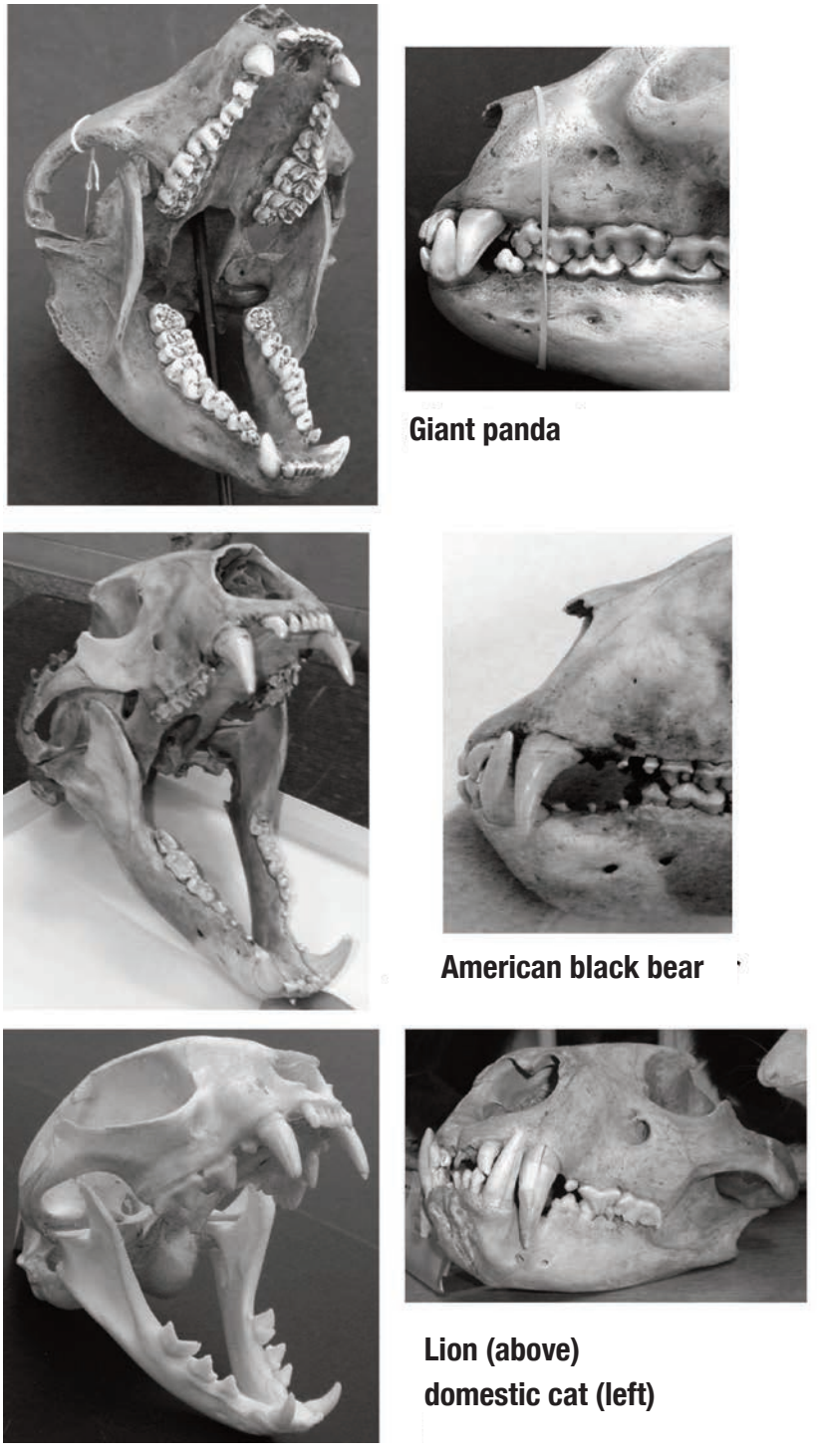

Figure 2. Teeth of a panda and three carnivores showing how short and blunt the canine teeth of the panda are in contrast with the longer, sharper canines of the carnivores.

History of the Myth

Despite a mountain of evidence to the contrary, the Melon Rex Myth persists. So where did this dinodang come from? Its root is the doctrine that death—hence also killing and therefore carnivory—did not exist before Adam and Eve sinned by eating the forbidden fruit in the Garden of Eden. In the New Testament book of Romans, the Apostle Paul says that it was through the sin of Adam that death entered the world (Romans 5:12–14). Death is therefore part of the Curse, the penalty for Adam's sin. Early Christian church leaders interpreted this to mean that the sin of Adam brought spiritual, not physical, death (Bray 1998). However, many of today's YECs insist that Adam's sin brought physical death. Without death there can be no carnivory, so all the animals that God created were originally herbivores. Herbivory does kill plants, but according to proponents of the doctrine of original herbivory (hereafter abbreviated DOH), the semantics of biblical Hebrew indicate that plants are not considered alive in the same sense that animals are, so the Curse introduced only animal death (e.g., Ham et al. 1990; Mitchell 2006).

DOH proponents often claim that tyrannosaurs and other theropods were originally herbivores. In two children's books on dinosaurs, Duane Gish (1977, 1992) acknowledged that theropod teeth, claws, and jaws suggest carnivory—but he also insisted that all animals were created herbivorous. "Whether these animals were able to change naturally into meat-eaters merely by a change in the kind of food they liked, or whether God had to change them, we do not know," he wrote (Gish 1977), essentially asking whether God created theropods with apparent weaponry for some peaceful purpose or whether he created them without the weaponry that appeared only in later generations. In a dinosaur book for adults, Ken Ham (1998) posed the same question, this time specifically about the teeth of *T. rex*.

So far no YEC author has expressed a preference for the second answer (that theropod teeth changed in later generations) over the first (that theropods were created with their characteristic teeth), possibly because the second answer introduces limited acknowledgement of evolution. The first answer raises another question: if theropods originally had ziphodont or incrassate teeth, then on what were those teeth used if not meat? So far the only concrete proposals are Unfred's (1990) melon rind suggestion, Gish's (1990) suggestion that the teeth and claws of *T. rex* "were used to eat tough roots and bark, etc.," Ham's (2009) suggestion that theropods ate pumpkins and watermelons, and this bizarre tidbit from children's author Larry Dye "The Creation Guy": *T. rex* teeth "were designed to rip apart branches. Like a tree

saw, God designed T-Rex [*sic*] teeth with serrated edges so the animal could easily cut through branches. Animals like a brachiosaur would keep leaf foliage under control, and a T-Rex would keep branch growth under control" (Dye 2008).

Unfortunately for the pumpkin and watermelon suggestions, pumpkins did not leave their native South America until after the time of Columbus (Sanjur et al. 2002). Watermelons are native to southern Africa and did not leave the continent until the first millennium BCE (Dane and Liu 2007). Theropods in the rest of the world would have starved until then if these items were their staples. Poor *T. rex* could not have eaten watermelons because they did not arrive in its North American home until four centuries ago (Dane and Liu 2007).

In another children's book, Taylor (1987) lists several reasons to doubt theropod carnivory. Taylor claims that *T. rex* could not have been a predator because it moved too slowly, walked in a "stooped-over" position, had poorly rooted teeth, and had weak forelimbs. The thin head crests of *Dilophosaurus* were too delicate to escape harm while the animal tore into the insides of carcasses; the "long, delicate spines attached to the back bone" of *Spinosaurus* would have broken easily during violent encounters; and unworn teeth in an adult specimen of the tyrannosaur *Albertosaurus* suggest a lack of contact with bone.

None of Taylor's arguments holds water. The limb proportions of *T. rex* are no worse for speed than those of its known ceratopsian and hadrosaur prey. Walking "stooped-over" with its mouth low put the mouth at a perfect height to bite prey (Senter 2007). As mentioned above, the teeth were rooted well. The forelimbs of *T. rex*, despite their shortness, were powerfully muscled (Carpenter and Smith 2001). Thin crests on the top of a head are in no danger if prey is approached from above. The dorsal spines of *Spinosaurus* were not delicate at all but quite robust (Stromer 1915). Lack of wear on teeth indicates only that they were new teeth in a mouth that constantly replaced old teeth with new; it does not indicate that the old, replaced teeth had never contacted bone.

In support of the idea that theropod teeth were designed for herbivory, some YEC authors have offered examples of putative extant analogs. Several authors name the giant panda as an example of an herbivore with "sharp teeth" (Taylor 1987; Ham et al. 1990; Gish 1992; Ham 2001, 2006, 2009; McIntosh and Hodge 2006). Some also list fruit bats (Taylor 1987; Ham et al. 1990; Gish 1992; McIntosh and Hodge 2006; Ham 2009), bears (Taylor 1987; Ham 2001, 2009), camels (Ham 1998), spider monkeys (Unfred 1990), and apes (Taylor, 1987; Gish 1992) as examples of herbivores with "sharp teeth."

There are problems with all these examples. First, *none of these animals has ziphodont teeth*! Their "long, sharp" teeth (the canine teeth) are therefore not applicable to the question of what theropods ate. In all these animals the teeth that process food are the cheek teeth, which are flattened with low cusps. The canines are not typically used for herbivory except in fruit bats, which use the canines to grip fruit (Neuweiler 2000). Also, in pandas the canines are not sharp but quite blunt, especially in comparison with those of other bears (Figure 2).

Second, bears and apes are not strict herbivores. Vertebrate prey and carrion make up significant portions of the diets of most bear species. Grizzlies even hunt big game like elk, and the polar bear is almost exclusively carnivorous (Nowak and Paradiso 1983; Kurt et al. 1990). Cannibalism is common in the brown bear, the polar bear, and the American black bear (Kurt et al. 1990). Among the apes, Sumatran orangutans regularly hunt and eat the smaller primates called lorises (van Schaik et al. 2003); chimpanzees hunt and eat antelope, wild pigs, rodents, and other primates (Uehara 1997); and bonobos eat rodents and juvenile antelope (Uehara 1997).

Furthermore, in spider monkeys and apes, the canines are long and sharp only in the males. The canines are unimportant in food processing, and in

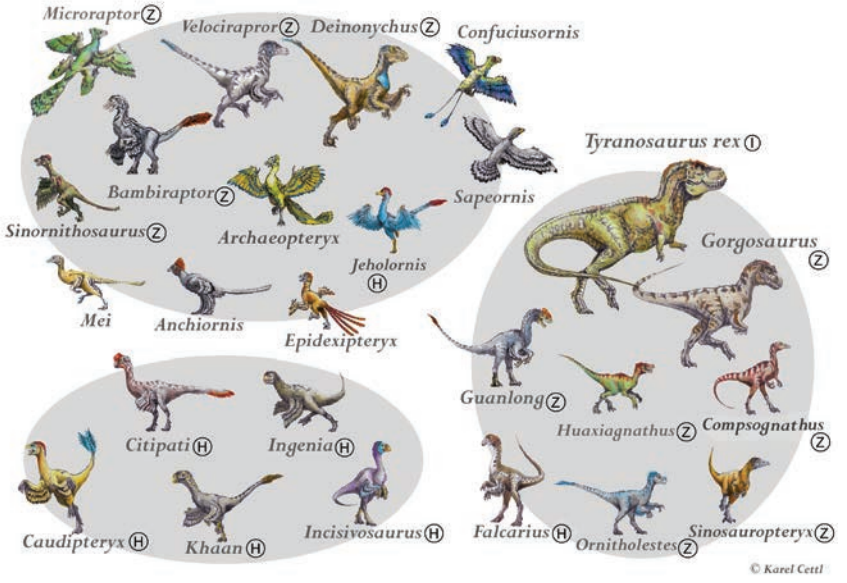

Figure 3. Members of three separate "created kinds" of coelurosaurian theropod dinosaurs (not drawn to scale), according to Wood (2011). The lower left group is composed of oviraptorosaurs. The upper left group includes early birds (*Epidexipteryx*, *Archaeopteryx*, *Jeholornis*, *Sapeornis*, *Confuciusornis*), troodontids (*Mei*, *Anchiornis*), and dromaeosaurids (the rest). The group on the right includes *Falcarius*, the herbivorous ornithomimosaurs (not shown), *Ornitholestes*, tyrannosaurs (*Guanlong*, *Gorgosaurus*, *T. rex*), and compsognathids (the rest). Note that although two of the groups include members with carnivory-indicating ziphodont (Z) or incrassate (I) teeth, each group also contains herbivores (H). This shows that there was never a need for young-Earth creationists (YECs) to postulate that ziphodont- and incrassate-toothed theropods were herbivores, because they are related to herbivores even according to YEC criteria. It is therefore consistent with the YEC paradigm to postulate that the original members of each "created kind" were herbivores, and their descendants acquired ziphodont or incrassate teeth only after turning carnivorous as a result of the Curse.

primate species that do use canines on food the minuscule canines of the females are sufficient (Greenfield 1992). If long, sharp canines were needed for processing plant food, then the canines would be long and sharp in both sexes. In fact, the males use them as instruments of aggression and often death (Plavcan et al. 1995). In spider monkeys, other monkeys, gorillas, and chimpanzees, males use their canines to wound and often kill rival males and the infant offspring of other males (Collins et al. 1984; Fossey 1984; Shimooka et al. 2008; Vick 2008). The males sometimes cannibalize the infants that they have killed (Collins et al. 1984; Fossey 1984), which makes their canines weapons for carnivory. In camels also, the formidable, sharp front teeth are present only in the males (Smuts and Bezuidenhaut 1987). If they were necessary for the diet of the camel, they would be present in both sexes. As in primates, male camels use their sharp front teeth to wound each other (Klingel 1990).

As it happens, insistence that tyrannosaurs and ziphodont theropods were herbivores is not necessary for the creationist doctrine of original herbivory.

It is noteworthy that the cheek teeth of all these herbivores are of a crushing type that indicates herbivory and that such teeth are absent in *T. rex* and ziphodont theropods. A "very good" creation would not include teeth that are unnecessary for food processing and instead used for violence. It is more consistent with the YEC worldview to suppose that the long, sharp, wounding teeth of today's bears, primates, and camels were absent in their created forebears and appeared in later generations as a result of the Curse, as some YEC authors have postulated for other biological attack/defense structures (McIntosh and Hodge 2006).

Why the Melon Rex Myth Is Unnecessary

As it happens, insistence that tyrannosaurs and ziphodont theropods were herbivores is not necessary for the creationist doctrine of original herbivory. This is because some theropods had teeth that indicate a diet of plants, and the results of a new study (Wood 2011) indicate that those theropods are genetically related to carnivorous theropods, even according to YEC criteria (Figure 3). YECs could therefore rescue the DOH by claiming that carnivorous theropods are degenerate descendants of ancestors that were created herbivorous.

YECs have long recognized that each baramin ("created kind" of organism) has diversified into many species since it was created. Recognized diversity within a given baramin often meets or exceeds the level of family in mainstream taxonomy (Sigler 1978; Wood 2006, 2008). For example, baraminologists consider all extant cat species—house cats, ocelots, bobcats, lions, tigers, and so forth—to be descendants of the original cat that God created to populate Eden (Robinson and Cavanaugh 1998). Baraminologists use statistical measures of anatomical similarity to determine which species belong to which baramins (Wood 2006, 2008). The recent study (Wood 2011) applied such methodology to Coelurosauria, the group of theropods most closely related to birds. The study found morphological continuity within each of three coelurosaur groups and morphological discontinuity between the three groups. The baraminological interpretation of this is that three baramins had been identified (Figure 3). One of the three groups is composed of the beaked oviraptorosaurs, which were herbivores (Smith 1992; Zhou and Wang 2000). Another includes the seed-eating (Zhou and Zhang 2002) early bird *Jeholornis*, other early birds such as *Archaeopteryx*, and the birdlike theropod families Dromaeosauridae (carnivores such as *Velociraptor*) and Troodontidae (some of which, according to one study, may have been herbivorous [Holtz et al. 1998]). The third includes tyrannosaurs, compsognathids, ornithomimosaurs, and *Falcarius*. *Falcarius* and the ornithomimosaurs were herbivores (Barrett 2005; Kirkland et al. 2005).

In two of the three groups, ziphodont theropods are connected, via a continuous series of intermediate forms, to herbivores. It is consistent with the YEC worldview to infer that God originally created theropods with herbivore-style teeth like those of *Falcarius* and *Jeholornis* and that ziphodont and incrassate teeth arose in later generations as a result of the Curse. A shrewd creationist could therefore rescue the DOH by claiming that both baramins began with herbivorous forms, and some of their descendants became carnivores after the Curse and gained the teeth to match the diet.

Of course, for the DOH to be rescued in this manner YECs would have to recognize that *T. rex* and ziphodont theropods were carnivorous. The Melon Rex Myth would therefore have to be discarded. To me, this is a little saddening. The Melon Rex Myth is by far my favorite dinodang. It has given me countless hours of joyous chuckling, and once it finally becomes extinct I will miss it very much. ■

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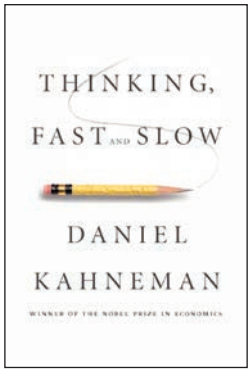
What's Going On in Our Minds?

PAUL BROWN

Quick as you can, read the following sentences and answer the question. Observe your mind as it fumbles to its conclusion.

> Kim buys one bat, and one ball. Kim spends $1.10. Kim's one bat cost $1 more than Kim's one ball. How much did Kim spend on the bat?

An apparently instinctive human reaction drives many people to blurt out the (wrong) answer, "One dollar!" Others pause before speaking, think for a moment, probably frown, break eye contact, and eventually respond (correctly), "One dollar . . . and five cents." Professor Daniel Kahneman belongs to a third group of people who start thinking just as the rest of us stop. They pay attention to the mind at work and ask themselves, "Hello. What's going on here, then?" Kahneman's book *Thinking, Fast and Slow* is instructive to rationalists and skeptics because of what it tells us about the nature of human error.



***Thinking, Fast and Slow*. By Daniel Kahneman**
Farrar, Straus and Giroux, New York, 2011.
ISBN: 978-0-374-27563-1
499 pp. Hardcover, $30.

The little *gedankenexperiment* above is just one of a great many that anchor the ideas of Kahneman's book to the empirical bedrock. Much modern psychology—or *cognitive science* if you prefer the fashionable term—relies on experiment to pick apart our mental machinery. Researchers assemble a group of people in a room to ask them a list of cunningly designed questions. They time their subjects' responses and compare their answers with what is "reasonable" or "rational." What we've learned from all this science is that while human beings don't all respond in precisely the same way, as a species we exhibit quite a few counterintuitive quirks and habitual, or instinctive, *cognitive biases*. In other words, our answers are wrong in systematic and predictable ways.

How does all of this work? Kahneman offers the following explanation: Brains evolved to be pattern-seeking machines. Biologically speaking, our brain's primary function is to make sense of the overwhelming mess of sensory stimuli to which our environment exposes us. In Kahneman's telling of it, brains aren't passive receptors. Rather, our grey matter is constantly trying to construct a coherent model of the world "out there" in order to guide our reactions to it.

But there's a problem. A brain is a terribly expensive organ to run. Primate brains consume 20 to 25 percent of the body's energy budget. So what's a poor organ to do? The answer appears to be that our brains use mental shortcuts (*heuristics*) that allow for massive reductions in brain-power at the cost of the occasional error. If you think about it, even with these shortcuts our brains are pretty astounding. Stand up, walk to the bathroom, open the door, adjust the shower heat, apply soap—consider the sea of unconsidered action upon which our relatively tiny consciousness floats. Mental heuristics are many and mostly trivial, but they can be tremendously potent. Mental shortcuts are what "tell" an experienced surgeon when his patient is about to hemorrhage, or a fire captain to pull his crew from a building just before it collapses, or a cook when the salmon is grilled to perfection. Sophisticated, learned responses often cannot be rationally justified. They just "feel right."

Kahneman refers to this large collection of heuristics as "System 1." System 1 "operates automatically and quickly, with little or no effort and no sense of voluntary control." In short, System 1 is a sense-making machine, and we rely on it almost exclusively to get through our days. Alas, System 1 isn't perfect. Error is built into its design. It is far, far better that our minds "detect" or "construct" a nonexistent snake a hundred times than overlook a real snake just once.

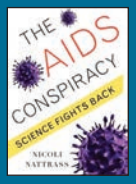
Now, as we saw in the example of Kim's bat and ball, there is also a second mode of mental operation. Kahneman

refers to it as "System 2," but you'll also see it elsewhere referred to as "executive function" or "cognitive control." It's the part of our brain that steps in from time to time, overriding System 1. "System 2 allocates attention to the effortful mental activities that demand it, including complex computations," Kahneman writes. "The operations of System 2 are often associated with the subjective experience of agency, choice, and concentration." System 1 thinks fast; System 2 thinks slowly.

***Thinking, Fast and Slow* is in part a catalog of the ways we slouch into error: circumstances where we opt for a quick, low-cost, and coherent worldview over mental hard labor.**

System 1's heuristics are fine as responses to our everyday environment, but they are poor guides for reasoning about subjects expressed in terms of quantities, time periods, or probabilities—all more properly the province of System 2. *Thinking, Fast and Slow* is in part a catalog of the ways we slouch into error: circumstances where we opt for a quick, low-cost, and coherent worldview over mental hard labor. Kahneman shared the 2002 Nobel Prize in Economic Sciences for the application of these psychological insights to the way human beings make economic decisions and, while not strictly within the scope of a review with skeptical and rationalist readers in mind, this book's critique of the shambles and shenanigans that characterize financial markets is pretty withering.

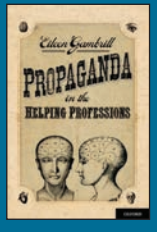
[NEW AND NOTABLE *Listing does not preclude future review.*



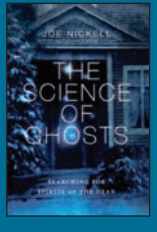
THE AIDS CONSPIRACY: Science Fights Back. Nicoli Nattrass. The world's leading expert on AIDS conspiracies delivers a definitive account of the origin and the dubious science behind these claims, as well as the political issues surrounding South African president Mbeki's embrace of AIDS denialism. Columbia University Press, 2012, 226 pp., $34.50. Also available as an e-book.

GREY WOLF: The Escape of Adolph Hitler. Simon Dunstan and Gerrard Williams. A military historian and a journalist claim to have uncovered evidence that Hitler did not die in 1945 but instead escaped to South America where he died in 1962; though the book offers perhaps the best case for this conspiracy theory, it's not clear how convincing historians will find it. Sterling Publishing, 2011, 384 pp., $24.95.

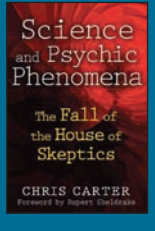
THE MARTIANS HAVE LANDED! A History of Media-Driven Panics and Hoaxes. Robert E. Bartholomew and Benjamin Radford. A highly readable litany of hoaxes, scares, and sensational exaggerations promulgated variously on radio, on television, in newspapers, on the Internet, and, for some, seemingly "everywhere"—many of them quite recent—that have had an impact on people's lives. McFarland, 2012, 248 pp., $40.



PROPAGANDA IN THE HELPING PROFESSIONS. Eileen Gambrill. A comprehensive and fascinating review of centuries of fads, fallacies, and misinformation in the healing professions, this book contains countless examples of fallacious appeals to science (an advertisement for "radium suppositories" on page 201 is particularly unnerving) as well as useful discussions of spotting fallacies in health-related fields. Oxford University Press, 2012, 567 pp., $65.



THE SCIENCE OF GHOSTS: Searching for Spirits of the Dead. Joe Nickell. Nickell begins with the cultural and psychological forces that shape beliefs in ghosts, then he presents case studies that take him to numerous supposedly haunted places. His book examines spiritualism and mediums who claim the ability to contact the dead and analyzes the evidence of those who visit allegedly haunted places. Prometheus Books, 2012, 290 pp., $18.



SCIENCE AND PSYCHIC PHENOMENA: The Fall of the House of Skeptics. Chris Carter. In this book reprinted from 2007, the author tries mightily to defend psi research against (mostly CSI-affiliated) critics by appealing to quantum physics(!) and suggesting that science needs to be reinterpreted to allow for the acceptance of psychic powers; a mildly interesting look at anti-CSI polemics, peppered with logical fallacies and misquoted skeptics. Inner Traditions, 2012, 300 pp., $18.95.

—Kendrick Frazier and Benjamin Radford

Skeptics will find that the ideas in Kahneman's book arm them with both sword and shield. If you're ever exasperated at the way some human beings manage to remain sublimely indifferent to evidence, Kahneman offers an explanation that plea-bargains any charge of malevolence down to mere laziness. Mental work is hard, and monkeys don't like it. Thinking about abstractions such as numbers or general laws of nature reduces the amount of energy and attention we can invest in more practical and immediate problems like gathering fruit, not standing in fire, avoiding bad meat, or figuring out when another monkey is up for a cud-

Skeptics will find that the ideas in Kahneman's book arm them with both sword and shield.

dle. If your worldview includes superstitious or irrational beliefs, your System 1 will go to extraordinary lengths to weave your experiences together to tell you a coherent story that is consistent with those beliefs—and since on a day-to-day basis there's little penalty for believing in things that don't exist, why change?

But the book also reinforces the idea that skeptics are human beings too, and human beings are never more prone to error than when we are overconfident. Hubris yields error, and Kahneman and his colleagues have famously shown how few human specimens display more hubris than "experts." It's apparent that even when we *know* we're in error, even when we've been alerted to the nature of the mistake, even after we've made the mistake and it's been pointed out to us and explained to us, it takes tremendous effort on our part to rewire our brains.

Kahneman makes that point with another of his experiments. Based on the following thumbnail biography, which of the two subsequent statements is most probably true?

"Wendy is young, of average appearance, and socially awkward. From a young age she excelled at school and went to an elite university, completing her doctorate. She is married with a daughter."

1. Wendy works as a librarian.
2. Wendy works as a librarian and is an active feminist.

Confronted with a version of this puzzle, no less a rationalist and skeptic than Stephen J. Gould wrote, "A little homunculus in my head continues to jump up and down, shouting at me." For those of you puzzled by the problem, it helps to retell the story in stark, mathematical terms. Given any two probabilistic propositions, A and B, which is more likely? A? Or A *and* B? If the mathematics of probability means anything, it means that "Wendy works as a librarian" *must* be more "probably true" than "Wendy works as a librarian and is an active feminist." Every librarian who is an active feminist is still a librarian, and there are surely librarians who are not feminists! But our lazy brains prefer the more detailed, coherent, and more plausible story to the energy-intensive work needed to arrive at the truth. Kahneman provides several examples of large-scale mistakes that required entire communities of highly trained professionals—himself included.

For readers interested in personal error—both understanding and avoiding it—the book isn't especially comforting. Kahneman explains that human beings are terrible at perceiving their own errors and worse at learning from them. Consciously changing our own beliefs by considering the evidence is apparently terribly hard—never mind the beliefs of others. So what's a rationalist to do?

Well it turns out that for all our failings at self-regulation, we're actually pretty decent at spotting mistakes made by other people. Anyone who has spent any time in a collaborative work environment will instantly recognize the phenomenon. It might never occur to me to examine each step along the path from insight to conclusion, but fortunately other people can typically be relied upon to tell me I'm wrong and why. Rationalists can take some comfort in the thought that the institutions of scientific practice and peer review exploit this aspect of human nature.

What about changing the minds of others? Here, Kahneman's view is at first glance rather bleak, but it offers a curious kind of hope. If you ask people, "Do you believe X?" they will answer either "Yes" or "No." If you ask them, "Have you always believed X?" they will typically respond that they've never changed their minds. Enquire of their opinions on a scientific or political controversy and they'll explain them to you. Then supply new information (pro or con), repeat the questions, and what you find is that Lo! their minds have changed . . . hardly at all.

However, if you ask people at different times what they think, you will find that their minds *have in fact* changed. Psychologists have noticed that evidence not only changes our current beliefs but also our memory of what our beliefs were *before* we acquired the new information. Gradual evolution of public sentiment is apparent in survey responses to questions about religious beliefs, the existence of satanic cults in daycare centers, or the wisdom of the Raiders' second round draft choices. Minds, it seems, aren't changed abruptly through reason but gradually as the heuristics by which our minds construct their coherent worldviews adjust. And we typically fail to perceive how much change we've undergone.

Kahneman uses this System 1/System 2 framework to examine questions about how people arrive at deci-

sions with uncertain information, how we think about risk, and how we construct our lives through a combination of experience and memory. Throughout the book readers will find memorable, pithy pronouncements such as, "Language implies that the world is more knowable than it is" or "Nothing in life is as important as you think it is when you are thinking about it" or (quoting another psychologist) "Subject's unwillingness to deduce the particular from the general was matched only by their willingness to infer the general from the particular."

Anyone who has followed recent public policy debates about behavioral finance or prospect theory will find little in the book that goes beyond recapitulating the greatest hits of one man's very productive career as a working research psychologist. Kahneman also stays mute on the kinds of big questions skeptics would like answered, such as why people persist in irrational and even self-destructive beliefs. He prefers to report the evidence and provide softer, more personal advice on how best to grapple with our own biases and guard against errors when pricing bats and balls.

For readers interested in deepening their understanding of what is going in their own minds (and how to guard against their own errors), it's hard to pass up a book with such a combination of persuasive power and pedigree. ■

Paul Brown is a computer scientist who specializes in building data management applications for very large scale science projects. Although he has published extensively in perhaps the world's most obscure professional research journals, this review is his first foray into popular writing.

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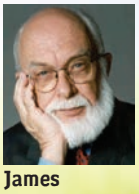

James "The Amazing" Randi

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Michael Cardus
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Skepticism in Popular Culture
'Sciencey' Amateur Paranormal Investigation
Doomsday & Antimatter Pseudoscience

Amateur Investigation Groups

In Sharon Hill's article, "Amateur Paranormal Research and Investigation Groups [ARIGs] Doing 'Sciencey Things,'" (SI, March/April 2012), Hill writes, "ARIGs are unique in that they examine areas on which no organized academic research or inquiry is focused—perceived paranormal events."

I'd like to counter, perhaps obviously so, that there is an entire cottage industry devoted to so-called "academic" paranormal research and investigation. "Holistic," "metaphysical," or "parapsychic" academic institutions offer a variety of master's and PhD degrees in the scientific study of such areas as Ayurveda, intuitive healing, angel studies, feng shui, numerology, astrology, and Atlantis studies, just to name a few. These academic institutions are, of course, nothing more than diploma mills: they typically have no physical campuses, promise at-home or over-the-Internet coursework, or offer "life experience" credits. Often their "faculty" members have credentials only from that same institution. (John Bear has published extensively on the topic of diploma mills, e.g., QuackWatch.com).

I know a person with a PhD from such an institute. As Hill described, this person expends quite a bit of energy cultivating a serious, science-like image to enhance her sophistication and credibility. Yet she is completely ignorant of the scientific method, the need for rigorous hypotheses and controls, and why data falsification and fabrication are to be eschewed. But she did meet the requirement of citing at least five references for her PhD dissertation!

Paul Drumheller
Flagstaff, Arizona

Sharon Hill replies:

They do call themselves academic, but setting up your own school is a bit like cheating. I did look at these organizations. Some even have scientists running them. Thus, they didn't qualify as ARIGs and were not included in my survey. On the other hand, the rise in genuine academic interest in anomalistic psychology by people like Professors Richard Wiseman and Chris French to examine paranormal topics is an exciting direction.

Antimatter and Pseudoscience

Regarding your article "Antimatter Pseudoscience" in the March/April 2012 issue of the SKEPTICAL INQUIRER, author John Eades was right to note that Bob Forward (who had long championed antimatter research) was interested in antimatter for propulsion. And he was right to characterize Forward as one concerned with getting the science right.

In 1994, I cosponsored a workshop at NASA's Jet Propulsion Laboratory to consider the possibility of faster-than-light (FTL) communication and/or travel. Bob Forward graciously put together a background paper on the topic, noting various ideas that had cropped up in physics (e.g., tachyons) but maintaining throughout a strict scientific approach. My aim in the workshop was to bring together PhD-level physicists to brainstorm what might be possible while always being mindful of what we knew of physics. We had intended to get Kip Thorne there, but he was on a book tour; however, we were able to get his student, Michael Morris ("codiscoverer" of the "Morris-Thorne wormhole" described in the *American Journal of Physics*). The workshop basically concluded that there didn't seem to be any way to achieve FTL communication or travel but that there were enough anomalies in physics that it couldn't be ruled out.

Finally, two studies of antimatter propulsion have recently been conducted. It turns out that the efficiency of any of the four classic antimatter propulsion concepts is too low to make antimatter propulsion attractive. For the time being we're "stuck" with chemical and nuclear fission propulsion with the hope that someday some sort of fusion or advanced plasma propulsion might be developed.

Gary L. Bennett, PhD
Boise, Idaho

John Eades replies:

Thank you for your letter and separately sent papers concerning the ideas of Bob Forward et al., which I have read with great interest. In my opinion there is nothing wrong with looking carefully at questions like antimatter propulsion and faster-than-light phenomena as long as one realizes that they are speculations and will—unless someone finds some way of getting around such things as the law of energy conservation in the first case and the observational evidence supporting the invariance of the speed of light in the second—remain so. In my opinion, such developments are very, very unlikely indeed.

Bob, who was in my opinion a real gentleman, once said to me that he didn't mind being criticized or not being taken seriously. He just thought that ideas like his should not be rejected out of hand without proper investigation. He also gave me the impression that his feet were firmly on the ground and that he would accept without hesitation the verdict of nature.

Concerning antimatter, the first spectroscopic measurements on antihydrogen have just been published in Nature. *Although this is something of a tour de force, much higher precision will have to be attained before such experiments can be said to constrain the matter-antimatter symmetry principle (CPT invariance) meaningfully.*

Concerning faster-than-light phenomena, we have recently had quite a shenanigan about allegedly superluminal neutrinos. The general feeling around here was that

this was more in the nature of a test of the accuracy of geodesic time and distance measurements than a test of the invariance of the speed of light. In other words, people were exercising the natural skepticism basic to the practice of science. Francis Bacon put it rather well when he wrote: "If a man will begin with certainties he shall end in doubts, but if he will be content to begin with doubts, he shall end in certainties." Even the authors of this work began with doubts by quite properly inviting the physics community to shoot down the superluminal interpretation. As a result of this, potential sources of error have recently been found that may soon end in certainty, one way or the other. My money is on the other, but we have to wait and see.

I enjoyed the article on antimatter by John Eades, but I take exception to the following paragraph on page 45:

> What this suggests is that we would be better off going and getting a few bucketfuls of the stuff from one of those antimatter stars. Here I refer you once again to Robert Park's book (2008) in which he shows that travel to even a nearby star within a human lifetime would consume many thousands of times the entire annual energy production of the Earth. And as if this wasn't enough, astrophysicists, far and wide in the cosmos though they have looked, have never seen even a hint of such stars.

Surely, Mr. Park is familiar with the explosion at Tunguska, Russian Siberia, June 30, 1908, which knocked down many square miles of forest and was apparently caused by the descent of a sizeable meteorite, or at least a huge mass of some kind. However, years of searching the site have turned up no meteorite or any other object.

In my reading on the subject I am sure that I have seen at least once the suggestion, "Perhaps it was not a huge mass of anything but a chunk of antimatter the size of a baseball." What more proof do you need that stars (and planets and galaxies and what-not) of antimatter are out there waiting to be discovered?

Gerald J. Cavanaugh
Cincinnati, Ohio

John Eades replies:

The conventional explanation of the 1908 Tunguska explosion is that it was caused by the arrival of a large piece of ordinary matter from space. Less destructive events of this nature happen all the time of course, but one of this magnitude would surely have left a crater and/or meteoritic remnants at the site. Neither has ever been found.

In 1965 it was therefore hypothesized that this event might have been caused by the impact of a wandering chunk of antimatter. Any such object must nevertheless have come from somewhere, and subsequent cosmic searches have revealed no potential sources of antimatter aggregates within many hundreds of millions of light years of Earth. The AMS experiment referred to in my article will likely extend this limit even further.

Furthermore, there is no local forensic evidence to support an antimatter impact. Work done since the 1960s strongly suggests that indirect neutron irradiation from annihilating antimatter would add a measurable amount of radioactive carbon-14 to the local environment. The dendrochronological record of surviving trees reveals, however, no unusual carbon-14 level at that time.

Also, Mark Boslough and David Crawford of Sandia National Laboratories have further demystified Tunguska with new supercomputer simulations showing that the damage seen could have been caused by the above-ground explosion of an asteroid object much smaller than previously thought, and therefore (because smaller asteroids are statistically more frequent than larger ones) more likely (SI, March/April 2008).

The best explanation of Tunguska is still that an asteroid or cometary fragment exploded in the atmosphere without leaving any surface residue. Until such time as much better evidence is adduced for it, the antimatter hypothesis will therefore remain an old babushka's tale, and the answer to Mr. Cavanaugh's question "What more proof do you need?" will continue to be: plenty!

Note: An excellent book-length treatment of this and many other antimatter topics is Frank Close's Antimatter *(Oxford University Press, New York, 2009).*

POINT OF INQUIRY
WITH CHRIS MOONEY & INDRE VISKONTAS

Point of Inquiry, named a top-ten podcast by *Business Insider*, is where the brightest minds of our time sound off on all the things you're not supposed to talk about at the dinner table: science, religion, society, and politics. **Chris Mooney,** author of *The Republican Brain* and *The Republican War on Science*; and neuroscientist (and opera singer) **Indre Viskontas**, engage in pointed and critical conversations with leading scientists, philosophers, social critics, and entertainers.

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www.pointofinquiry.org

Emotional Connections

Your editor's column "Getting People Emotionally Invested" (SI, March/April 2012) touched on a long-time concern of mine: the sense of loneliness as a nonbeliever.

After rejecting organized religion, I initially found at least an intellectual camaraderie with other nonbelievers, and I began subscribing to humanist publications. But as time has progressed, I've grown a bit weary of magazine articles that continue to debunk what I have already rejected, articles written by intellectuals who sometimes seem emotionally distant. It's not enough to be like-minded regarding religion. There needs to be an emotional connection, a sense of compassion and fellowship, something to fill the void when one leaves the church.

Roy F. Johnson
Columbia, Tennessee

Exeter Incident Aircraft

As usual, when the latest SI (March/April 2012) came in I read the letters to the editor first. I refer to the letters about the Exeter Incident. I was assigned

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Skeptical Inquirer
content available on our website!

Here's just a sample of what you'll find:

"You are Not Entitled to Your Own Bigfoot Facts"
"Sounds Sciencey" columnist Sharon Hill examines long-held "facts" about Bigfoot, the mysterious bipedal beast said to roam the North American wilderness; just how do Bigfoot proponents use the word *fact*?

The Denver Airport Conspiracy
Robert "The Big Shill" Blaskiewicz takes a close look at conspiracy theories surrounding the Denver International Airport; is it really a headquarter for world domination?

For more online columns, features, and special content, visit **www.csicop.org.**

to Pease AFB NH from January 1958 to May 1959 and worked on KC-97Gs of both the 100th and 509th Air Refueling Squadrons at Pease and during a three-month temporary duty assignment to Thule AB Greenland from late March 1958 through early July 1958. In contrast to the claims of two letter writers, these tankers did not have any J47s (external jet engines) fitted to them, period! They did carry large external fuel tanks outboard of the engines. Only after these aircraft were transferred to various Air National Guard (ANG) units were the J47s fitted in place of said external fuel tanks and their designation changed to KC-97L. To my knowledge, no ANG KC-97Ls ever refueled any B-47 at any time. So Mr. McGeehan and Mr. Vujovich, in their two letters, were incorrect. Also, when KC-97Gs did refuel B-47s, these operations did not take place at too low an altitude for obvious reasons—the tanker had to dive at a shallow angle in order to keep its speed up to prevent the receiver from possibly stalling.

I am not disputing that some night tanker operations were going on that day of the Exeter Incident, just trying to straighten out what model aircraft was involved.

David Menard
Dayton, Ohio

Yes, But Who Wrote . . . ?

I was very surprised to read Kendrick Frazier's article, "Yes, But Who Wrote Einstein?" (SI, March/April 2012). My first surprise was that the article was not a discussion of Desanka Trbuhovic-Gjuric and Senta Troemel-Ploetz's claim that Einstein's three great papers of 1904 were written in collaboration with his (first) wife, Mileva Maric. (See Chapter 20 of Theoni Pappas, *Mathematical Scandals*, Wide World Publishing/Tetra, San Carlos, 1997). Recall that after his divorce in 1914, Einstein's only significant work was his 1916 paper on the general theory of relativity, the last four decades of his life being quite barren.

My second surprise was that Frazier neglected to identify either Eric Idle or Michael Palin, who of course were two of the six members of Monty Python, the legendary comedy team that gave us Monty Python's *Flying Circus* on television (1969–1974) and movies such as *The Holy Grail* (1974), *The Life of Brian* (1979), and *The Meaning of Life* (1983).

Thomas Wray
Ottawa, Ontario, Canada

Kendrick Frazier replies:

Thanks, but my little news note was only 172 words, almost as short as your letter and not allowing for extended discussion! And despite my flippant title, it of course was about not Einstein but a brief New Yorker *parody of Shakespeare deniers. I know who Michael Palin and Eric Idle are and am a Monty Python fan, so I'm happy to share with readers the Monty Python credits you list. To them I'd add one of my favorites, their hilarious musical,* Monty Python's Spamalot.

The Teachers Unions Controversy

I was sorry to see no one in the "Amen Corner" for Kenneth Krause's column regarding Teachers Unions (SI, November/December 2011). In your readers' Follow-Up column about it (SI, March/April 2012) he was castigated mightily for what I perceive to be sound reasoning. Perhaps his many detractors are standing too close to the problem. Once upon a

time, after receiving a graduate degree, I was offered "9 for 9" ($9,000 for nine months teaching). I declined and sought other fields because, even then, teachers unions seemed to be a tail wagging the dog.

Perhaps if Krause had originally led with his rebuttal (in the March/April issue) he would have defused some of those little petards. I recall my early years when my teacher arrived early, built the fire in the stove, attended to a fine education for eight grades, swept the floor in the evening, and had time to cinch the saddle on my horse before I rode home across the prairie. And, oh yes, did I mention it?

She was non-union.

Oliver R. Bishop
Westmont, Illinois

Bravo for your integrity and courage in publishing this article. I'm a skeptic for reasons I consider good reasons. I'm a political conservative for reasons I consider good reasons. I'm fed up with liberals hijacking skepticism and its institutions the way they have hijacked and prostituted innumerable other institutions and movements. May truth and reason prevail. The squealing of stuck liberals is music to my ears. Don't be bought or bullied.

Norman Carlson
Busti, New York

SKEPTICAL INQUIRER has spent decades educating us on the proper way to do scientific research. At the same time it has also devoted a great deal of effort to showing us how to write about scientific research. So what is there to say about the "Teachers Unions" piece? Many of the letters published in your March/April Follow Up column addressed the specifics of the inadequacies in Krause's piece much better than I could. What I would like to do is express my sadness. I am saddened that such an inferior piece of work was published in the first place. I was saddened by Kendrick Frazier's weak-wristed defense of his decision to publish the original piece. But I was saddened most of all by Krause's response to the criticism of the piece. Rather than provide a proper science-based rebuttal, he rants. It is mostly devoted to belittling the letter writers and anyone else who disagrees with him. It is completely lacking in additional evidence to support his position. In short it embodies all the attributes that SKEPTICAL INQUIRER has been railing against for all this time.

Patrick J. Russell
Seattle, Washington

I reject your blanket assertion that SKEPTICAL INQUIRER doesn't publish "diatribes" and that readers "should not ascribe political motives to the author or SI" in your response to readers' reactions to Kenneth Krause's column on teachers unions. SI editors and columnists are subject to the same cognitive processes as its readers, and scientific research strongly suggests that partisan political thought takes place in the emotional centers of the brain rather than areas associated with rational thought (see, for example, the *Journal of Cognitive Neuroscience* 18:11, pp. 1947–58). When you publish a column that cites evidence from only two sources out of dozens of peer-reviewed publications that have reached widely differing conclusions as to the impact of teachers unions on academic performance, and when both of the sources are fellows at a conservative think-tank, skeptical readers are obligated to point out what appears to be political bias.

Krause's original column (SI, November/December 2011) makes the extraordinary claim that "the *overall* [my emphasis] impact of unions on society . . . is decisively negative" without discussing unions other than teachers unions. In his response (SI, March/April 2012), Krause makes a further extraordinary claim that "collective bargaining is inherently anti-democratic," which he supports with one sentence of general logical arguments and one sentence based on appeal to expert opinion. When SI's editor allows a columnist to make extraordinary claims without providing extraordinary evidence, it violates your standards, and that justifiably provokes the ire of your skeptical readers.

Thomas Pasquarello
Cortland, New York

You ended your collection of "passionate [reader] responses" to the 2011 November/December "Science Watch" column about Teachers Unions with the pious assertion that "we don't publish diatribes; we publish informed analyses." This is followed by the author's response culminating in "public employee collective bargaining is an improper and potentially despotic delegation of critical governmental powers to unelected special interest groups. . . ."

Pardon me if I declare myself, shall we say, skeptical of your disclaimer.

Harvey Wachtel
Kew Gardens, New York

[FEEDBACK

The letters column is a forum on matters raised in previous issues. **Letters should be no longer than 225 words.** Due to the volume of letters we receive, not all can be published. Send letters as email text (not attachments) to letters@csicop.org. In the subject line, provide your surname and informative identification, e.g.: "Smith Letter on Jones evolution article." Include your name and address at the end of the letter. You may also mail your letter to the editor to 944 Deer Dr. NE, Albuquerque, NM 87122, or fax it to 505-828-2080.

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—The Editors

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[THE LAST LAUGH BENJAMIN RADFORD

SKEPTICAL ANNIVERSARIES

by Tim Farley

July 5, 1977: Vermont resident Sandra Mansi took what would become the most famous photo of (and "best evidence" for) the Lake Champlain monster; Joe Nickell and Ben Radford later analyzed the image and concluded it was a tree stump.

July 8, 1947: A poorly worded U.S. Army press release about recovered balloon wreckage near Roswell, New Mexico, eventually became the basis of a UFO legend.

July 8, 1977: The FBI conducted a massive raid of Scientology offices in response to the church's "Operation Snow White" attempt to infiltrate the U.S. government.

August 4, 2007: The first Skepticamp was held in Denver, Colorado. More than fifty of these informal community-organized skeptic events have since been held all around the world.

August 9, 1977: The first CSICOP Executive Council meeting was held. Among other business, Kendrick Frazier was appointed editor of the Skeptical Inquirer.

August 11, 3114 BC: The Mayans thought this was creation day and made it the first day of their Long Count calendar; misinterpretation of this calendar has led to predictions of cataclysm in December 2012.

August 16, 1987: An alignment of the planets and cosmic forces was predicted to produce a "Harmonic Convergence" and usher in a new era of world peace.

Tim Farley is a research fellow with the James Randi Educational Foundation and created the website whatstheharm.net.

HIDDEN MESSAGES by Dave Thomas

The following letters are a simple substitution cipher. If R stands for L, it will do so everywhere. Solution is by trial and error. Hint: Look for patterns in words; for example, the scrambled phrase "JRXJ JRQ" might represent "THAT THE."

PUZZLE

"GONJRJFDH LGO SFDSNCHJFDH ZFG EIJSI UIO ZLSUH FZ DLUCGO HCKKNX DF QLVFG KGOQJHOH."

—LQMGFHO MJOGSO

CLUE: X = Y

PREVIOUS PUZZLE SOLUTION (May/June 2012): "THE TRAGEDY IS THAT EVERY BRAIN CELL DEVOTED TO BELIEF IN THE SUPERNATURAL IS A BRAIN CELL ONE CANNOT USE TO MAKE LIFE RICHER OR EASIER OR HAPPIER."
—KAY NOLTE SMITH

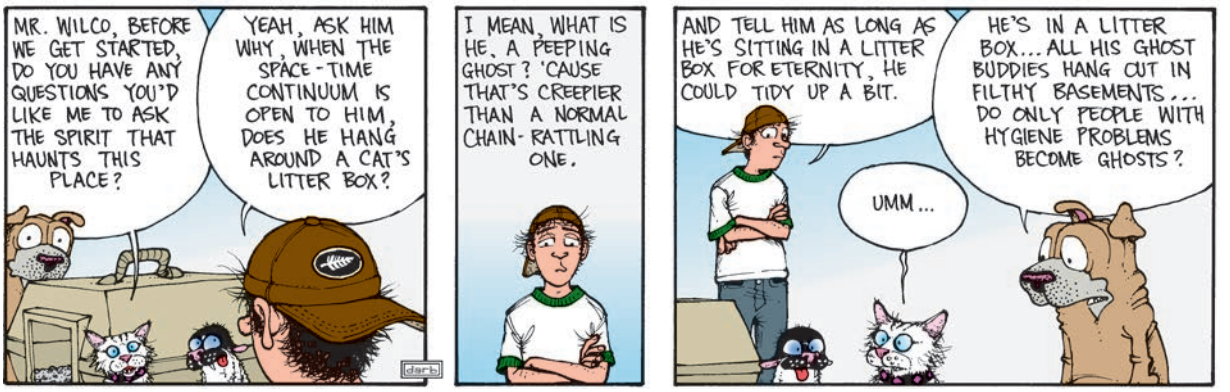
SUPER-SECRET WORD: UNSKEPTICAL
(Instructions: www.nmsr.org/secretword.htm)

Hidden Messages Puzzle Contest

Submit your solution by email to bradford@centerforinquiry.net or via postal mail to: Benjamin Radford The Last Laugh P.O. Box 3016 Corrales, NM 87048
Winner will be chosen at random from the first three correct submissions received by both email and postal mail.

May/June 2012 Hidden Messages Puzzle Contest Winner: **Jimmie J. McKinley**
This issue's prize: A one-year subscription (or extension) to Skeptical Inquirer.

GET FUZZY BY DARBY CONLEY


MR. WILCO, BEFORE WE GET STARTED, DO YOU HAVE ANY QUESTIONS YOU'D LIKE ME TO ASK THE SPIRIT THAT HAUNTS THIS PLACE?
YEAH, ASK HIM WHY, WHEN THE SPACE-TIME CONTINUUM IS OPEN TO HIM, DOES HE HANG AROUND A CAT'S LITTER BOX?
darby
I MEAN, WHAT IS HE, A PEEPING GHOST? 'CAUSE THAT'S CREEPIER THAN A NORMAL CHAIN-RATTLING ONE.
AND TELL HIM AS LONG AS HE'S SITTING IN A LITTER BOX FOR ETERNITY, HE COULD TIDY UP A BIT.
UMM...
HE'S IN A LITTER BOX... ALL HIS GHOST BUDDIES HANG OUT IN FILTHY BASEMENTS... DO ONLY PEOPLE WITH HYGIENE PROBLEMS BECOME GHOSTS?

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